The Builder.

Vol. XLIX. No. 2214. Saturday, July 11, 1885.

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The Argyll Ship Canal.

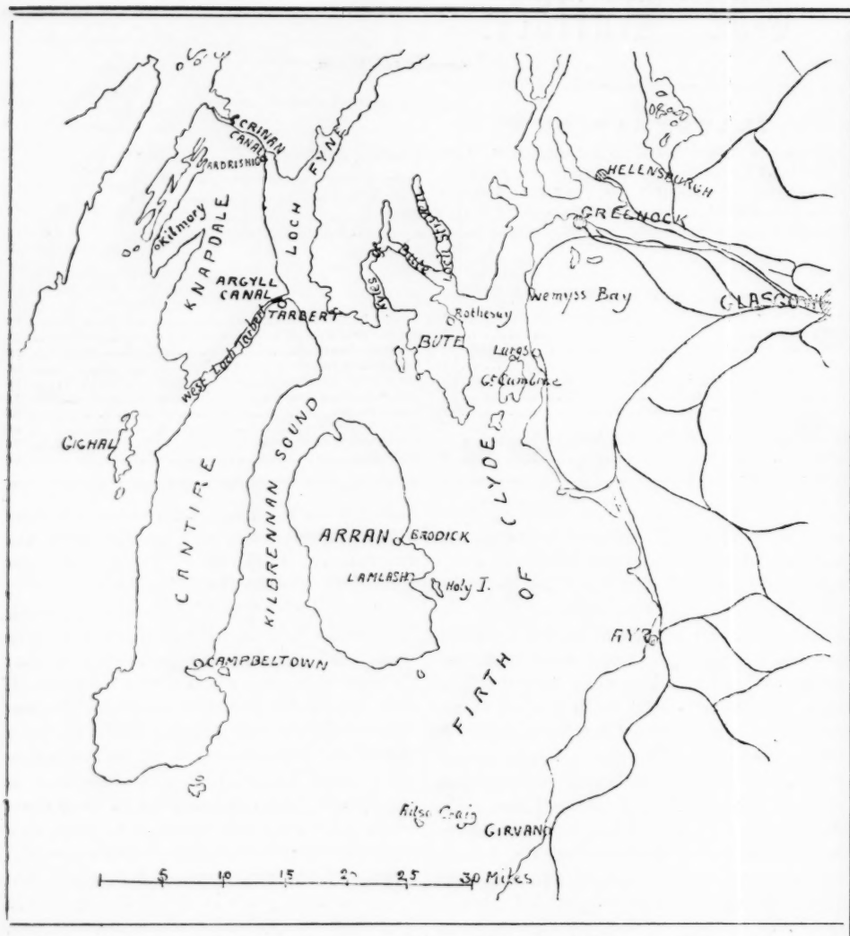
CARRING direct passage between the open sea waters of the Atlantic and the ports and harbours of the Clyde estuary and river, the peninsula of Cantire figures on the map as a huge southerly disposed pendant from the West Highland terminations of the Grampian range. This has its advantages and its disadvantages. The firth is thereby secured in the enjoyment of comparatively quiet waters, no matter how the Atlantic may thunder outside; and miles upon miles of sheltered coast line, which but for Cantire would have been storm-beaten and ironbound, are utilised almost without stint or measure for purposes of watering-place resort, and yacht and pleasure steamer sailing. On the other hand, ship navigation to and from Glasgow and Greenock is habitually impeded, in the case of all vessels engaged in the West Highland trades and the Baltic or north of Europe voyage, the southerly *détour* at present necessarily implying an added sixty miles at least of circuitous navigation. Besides, the neighbourhood of the Mull of Cantire which has thus to be doubled is a noted playground for unruly tideways and capricious fogs,—these, separately or in combination, not unseldom causing very serious delay. The peninsula of Cantire hangs to the main body of Argyllshire at Tarbert by the merest tag,*—less than one mile of width between inner and outer seas,—and the feeling has prevailed for a good many centuries that this trifling oversight on the part of nature ought to be artificially amended. Indeed, in the old time when the "Isles" were in possession of the Macdonalds by Royal grant and treaty, this family ultimately came to regard the existence of an isthmus at this point as a grievance too great to be borne.

As a part of the mainland, Cantire could not be claimed; as an island it could. Accordingly, in the year 1193, Macdonald, the then reigning Lord of the Isles, made Cantire an island to the satisfaction of his own conscience at least, not by the tedious and costly process of cutting a water channel, as is now proposed, but by sailing his war galley into West Loch Tarbert, and causing her to be dragged across the mile of neck with all her canvas set. The title thus acquired held its own till the reign of the fifth James, when the whole of that country fell into the possession of an ancestor of the existing Argyll family.

* See the diagram on next page.

The name "Tarbert" is common to a number of similarly situated parts on the west and north-west of the Highland coast-line, and means simply the "boat-carrying place," across which the light craft of the natives have for ages been carried or carted, towards the saving of many miles of round-about navigation. The neck between East Loch Tarbert and West Loch Tarbert is not only narrow in its direct line from beach to beach, but free of hilly ridge also, the summit level having an altitude above high-water mark of 56 ft. 6 in. only. The temptation to make Cantire really an island has naturally existed in strong force ever since canal-cutting became common within the British islands, and many have been the schemes propounded towards this end. In the year 1708 a preliminary Act was procured empowering the construction of a harbour at East Loch Tarbert, near to the eastern termination of the famous "portage." The work was carried out, and of small scope though it be, it has done good local service. In 1771 James Watt, of steam power renown, examined the isthmus, and pronounced in favour of a ship canal. Some years afterwards the crossing of the general peninsula at a point about fifteen miles further to the north became advocated, and the Crinan Canal was the result, an affair which the growth of steam navigation speedily put out of date,—limited as it is in draught of water, impeded by locks of small capacity, and involving some nine miles of trackage over a works summit level of 117 ft. The Crinan, well known to tourists, has been a convenience to one special line of coast steamers, furnishing, under normal conditions, water-communication of a kind between the two services of which the "Royal Route" is composed; but as a channel fed from uncertain fresh-water sources only, it is inconveniently subject to casual interruption through the effects of summer droughts, winter ice, sudden floods, and other causes. At the beginning of the present century Telford reported on the Tarbert scheme, and from time to time the call for a ship navigation cut at this point would as a matter of habit touch the acute stage, subside, and go temporarily to sleep again. Towards the middle of the century the problem was attacked with something more than the customary determination, and a Bill for works at a cost of 150,000*l.* was actually carried through Parliament in the year 1846, only to be succeeded, however, in 1849 by another Act sanctioning an abandonment of the enterprise.

Over the greater part of the intervening thirty-five years from then till now, the topic has been one for informal stock discussion Finally, in July of 1882, an influential meeting was held in Glasgow, the Duke of Argyll presiding, when the resolution was taken to form a company at once, and embark upon the undertaking forthwith. Parliament was applied to, and in the following year, 1883, the "Argyll Ship Canal" Act was duly passed. The works thus sanctioned have not been commenced yet, but the probability is that the lapse of 1846-9 will not now be repeated, even should the profound commercial depression,—really the only existing hindrance to an immediate commencement of operations,—prove more lingering in character than is anticipated. All canal projects of later times which offer *bonâ fide* facilities to large ship navigation have been endowed with a powerful vitality by the strides made during the last thirty or forty years in ship-building and in the improved application of steam propulsion, and this vitality is in all likelihood destined to carry into execution works compared to which the engineering task at Tarbert must rank as a trifle. From the anchorage ground off Greenock to the waters of West Loch Tarbert the straight-line distance is twenty-five miles only, while by the present sea route round the Mull of Cantire it is about 120 miles. True, the net difference between these two distances cannot be put to the credit of the proposed new cut, because of the somewhat circuitous nature of the navigation way between Greenock and East Loch Tarbert, but the saving may at least be set down at from fifty to sixty miles. To this, however, must in fairness be added, deliverance from the capricious tidal and meteorological moods of the Mull of Cantire, which often render the doubling of that point a matter of both risk and delay. Of course, only a portion, and that not by any means a conspicuous portion, of the entire traffic in and out of the Firth of Clyde would follow the new route. The extensive north-west coast intercourse by steam and sailing craft, now prosecuted *vid* the Mull, would be assured, as also the Baltic and general North of Europe trades. It would, to a certainty, be largely used for the passage of fishing-boats; and it is possible that, in certain weathers, Atlantic craft of all kinds, bound in or out, might take their custom that way. A considerable exchange trade in coal and agricultural produce has for some time existed and still grows along this line, and the Duke of Argyll, at the promoters' meeting of 1882, was so sanguine of the future of the Western Islands under the improved traffic conditions contemplated as to predict that these might yet, in the matter of dairy produce for the London market, supplant the west coast of France, which, at the time of speaking, carried off the best prices there. From all sources the traffic, according to the promotion estimate, is set down at close upon 500,000 tons annually.



yielding, at the rate of 6d., a revenue of 10,000*l.*

One reason for hesitation with regard to embarking seriously on the enterprise of cutting the Tarbert neck by means of subscribed capital exclusively, has been a very lively and very general impression that the Government itself would sooner or later undertake the work. It was unsuccessfully urged to do so in 1847, when famine raged in the Highlands, as an instant means of relief to a suffering people, and with great ultimate profit in prospect through the cheapness of the labour thus obtainable. Probably the sorry financial results of the great Caledonian Canal,—an undoubted engineering triumph, finished on Government money in 1822,—had estranged the minds of ministers from projects of the kind, and naturally so. Expectation with regard to this high quarter did not die out readily, however, the advantage of an alternative war-vessel route in and out of Clyde waters being deemed a strong inducement; but there has been no official movement in the desired direction, and the Duke of Argyll, in his address at the Glasgow initiatory meeting of 1882, was fain to declare that the project must henceforth be held as one for private enterprise.

The isthmus it is proposed to cut is situated rather over forty miles to the north of the Mull of Cantire,—at the nominal northern extremity of that peninsula, indeed; the district of Argyleshire further to the north,—though geographically considered but the inner portion of the same peninsular arrangement with the narrowed crossing of Crinan for isthmus proper,—being separately known as Knapdale. The long strip of Cantire, over forty miles in length,—a kind of breakwater on a Titanic scale,—has an average breadth of about six miles. West Loch Tarbert, cutting about ten miles inward from Atlantic waters, approaches the head of East Loch Tarbert a very small sheet projected westward from Loch Fyne, and suddenly reduces the width of this great natural mole to less than one mile. There is a pier at the south lip of the eastern loch, and a small village at its most westerly projection, the mile of distance thence to the head of the western loch being along a good and fairly straight road. The western loch, forming with its fringe of mingled rock, wood, and heath, a picture of no little beauty, has an excellent natural harbour and a good area of safe anchorage-ground. A weekly packet sails out of it for the outer islands, and in early times the route occupied a foremost rank.

The canal itself, or rather the artificial sea-channel as it may more appropriately be called, as designed by the Company's engineers, extends to about two miles in length from deep water to deep water, and includes within this the laying-down of training walls and a partial deepening of the head waters of both lochs. High water at West Loch Tarbert being in advance of that mark on the other side of the neck, a difference of water-level always exists to the extent of 2 ft. or 3 ft. at least, this, however, being liable to some considerable exaggeration during the prevalence of strong winds. For the purpose of regulating the flow to which this discrepancy would give rise the works will be furnished with a tidal lock, 400 ft. long, at the eastern entrance. Ships will pass freely in and out at all conditions of tide, and there will thus be afforded, from inner Firth to open Atlantic, a practically unimpeded and altogether weatherproof sea-water passage, 56 ft. wide and 18 ft. in minimum depth, in virtue of which Cantire becomes an island in fact as well as theory. The cutting, blasting, and dredging necessary will not be great, owing to the lowness of the summit level, the highest point, as already stated, being less than 60 ft. above the line of high-water mark. At first, vessels in excess of 17 ft. draught will be refused passage except under specific conditions, but the work will be executed throughout with a view to deepening and widening at some future period. The Argyll Ship Canal Company, by whom the waterway is to be built, start with a nominal capital of 200,000*l.* in 10*l.* shares, a sum thought to be amply sufficient for the object in view. The business domicile of the company is Glasgow, and the directorate will consist of from three to seven members. Mr. John Ramsay, of Kildalton, Islay, M.P. for the Falkirk Burghs, heads the directorate at present, and the Duke of Argyll is largely interested. Land-purchasing powers last till July 1886, under the Act, the limit for the execution of the works being seven years from the date of passing. Much of the capital has been subscribed, but the protracted general depression has hindered the swift progress which was anticipated at the initiation of the scheme. Messrs. Andersons & Pattison, solicitors, St. Vincent-street, Glasgow, are the law agents of the undertaking; Mr. J. Wyllie Guild, C.A., of the same city, acting as secretary. The engineers are Messrs. Blyth & Cunningham, C.E., Edinburgh.

NOTES ON SCULPTORS' MATERIALS.*

BY GEORGE SIMONDS.

WE now come to what the public are chiefly accustomed to consider as sculptors' materials, I mean stone and metal. The former may for sculptural purposes be roughly divided into porphyries, granites, limestones, and sand or grit stones. It is superfluous here to enter into their geological history and structure: I shall treat of them merely with regard to their fitness for sculpture. Porphyry is of two kinds, red and green; it is more durable than any other stone, and also more difficult to work. It is so hard that it can only be worked with the aid of the diamond or corundum wheel, or possibly,—though I do not know if that has ever been done,—by the modern sand-blast. Some idea of the difficulty and expense of working this stone may be gathered from the fact that the restoration of the Vatican sarcophagus, popularly known as that of St. Helena, took about twenty-five years to complete, and is said to have cost about twenty thousand pounds. Yet notwithstanding these difficulties, there are at least two colossal statues wrought from this intractable material by the hands of European artists: I mean the statue of Justice at Florence, and that of Rome on the Capitol; the head, hands, and feet of this latter are of white marble. During the sixteenth and seventeenth centuries a great many vases, busts, and other small works were produced in Italy, but of late years I do not know of any attempts to produce artistic work from this thankless material, although it is cut into thin veneers for architectural purposes, and is chiefly, I fancy, used in church repairs. The price of antique porphyry varies from time to time, but in Rome the usual price used to be about 4*l.* per cube foot, the price increasing with the dimensions of the block. All the supply was derived from the excavations. The modern porphyry seems inferior in colour to that used by the ancients. Granite, both red and grey, was of course much used for sculpture in Egypt, but it is too hard and too unpleasant to work to be of much use to a sculptor in the present day. The limestones are the most important, and under this heading we may class the various marbles, alabasters, dolomites, and oolites.

The marbles are very diverse in appearance and even more so in quality, some being so hard and flinty as to be almost useless for sculptural purposes whilst others are so soft and perishable as to be almost equally so. The marbles used by the sculptor are chiefly of two kinds, namely, white with a warm or yellowish tinge, and white with a cold bluish tinge. The first is known as statuary marble, the second is popularly called "Sicilian," although that is merely an English trade name, the marble having nothing whatever to do with Sicily and being quarried in the Carrara mountains. The chief quarries of these Sicilian marbles are in the valleys of Canal Bianco and Ravagione. This quality of marble is well suited for exterior work, but its cold tint is rather objectionable. As a rule the blocks are more or less veined with dark stains of a harder nature than the rest of the block, but it can be obtained free from these impurities and, indeed, so closely approaching the quality of statuary, as to be easily mistaken for the latter by the inexperienced when seen in the sunlight. And here I

* See p. 3, *ante*.

may as well remark that no sculptor should attempt to judge marble after the sun is up, and in Italy no one does. The best time for judging marble is on a dark rainy day, shortly after daybreak. On such a morning in Rome you would be sure to find a number of sculptors, each with his pointer, measuring and turning over the blocks on the Marmorata. By about six o'clock they will all have disappeared, having noted down the numbers and marks of those blocks which seemed to suit them best to communicate with the owners and strike a bargain at leisure. As the statuary marble all comes to market in blocks of rough shape and untrimmed, and, as the price is always by cube measurement, it often happens that disputes arise as to the number of cubic feet contained in a block, as all the corners, however useless, must be paid for. The price ranges up to two pounds per cubic foot for the best qualities, indeed I have known higher prices paid for exceptionally fine blocks.

Some years ago, when Pope Pius IX. had the old Marmorata excavated under the direction of Prof. Visconti, some large and fine blocks of statuary marble were discovered perfectly preserved amongst the river silt that had covered them to a depth of several feet. These proved to be Greek marbles, both Parian and Pentelic. These marbles are not pleasant to work, nor very pleasing in effect when freshly cut; they have an unpleasant amount of sparkle from the size and brilliancy of their crystals, and are also very unequal in hardness. The chisels strike sparks from them and are soon blunted. The Pentelic in this respect is worse than the Parian, and is, moreover, rather slaty in character, being in layers of hard and soft, with a more defined cleavage than most marbles show.

They have both, however, one advantage, namely, that with age they acquire a very lovely warm tint.

Resembling these in character are the statuary marbles of Tyrol, with the difference, however, that they are warmer in colour when freshly worked. I do not know these quarries myself, but I had opportunities of seeing these marbles worked in the studio of Prof. Steinberger in Rome, and they appeared, as I believe Prof. Steinberger found them, perfectly satisfactory. Another marble having the same warm tint and large crystals, and by no means an unpleasant marble to work, comes from an interesting but little group of quarries at Monterombolo, in the Maremma. The remarkable fact concerning the Monterombolo marbles is their strange diversity, every conceivable variety of statuary marble and many-coloured marbles also being found within the limits of a few acres. It is also interesting from the fact that in clearing out an old disused quarry some years ago an old Etruscan working was brought to light, and bronze quarry tools were found.

In the hands of the late owners these quarries were much mismanaged, and were a total failure financially. I have not been there for several years, but I do not fancy that they are being regularly worked at present. I know that there is statuary marble of the very finest quality there, but whether it will ever be available is another matter.

The principal statuary marble quarries at Carrara are the following :—Grestoli, of which a few years ago two quarries were open ; Betulia ; La Mossa ; Polvaccio, also with two workings ; Binelli ; Poggio Silvestro ; and last, but best of all, the splendid quarry of Monte Altissimo at Seravezza, of which M. Henraux is the fortunate possessor. Of all these marbles none is so well suited for sculpture of every description as Seravezza. It has only one defect ; it is apt to bear vents. This, I think, is not a defect natural to the marble itself, but I think is occasioned by the quarrying. It is an extremely costly quarry to work, and, after all, by careful selection of a block it is quite possible to get one that is perfectly sound. Some years ago I got over a block from this quarry which contained nearly 200 cubic feet, part of which I used for a group of Dionysos seated on a tiger, and the remainder was used for other works without my ever having to complain of any flaw or blemish. This was, M. Henraux told me, the first block of any size that had been sent to England. In France it is more used than any other. There is much jealousy between Carrara and Seravezza, and the merchants and owners of the former place always try to prevent any one from going to the latter in search of marble.

Grestoli is, perhaps, the best of all the Carrara marbles ; it is close-grained, as, indeed, all these marbles are, of a good tint, and works pleasantly under the chisel ; it is harder than the other Carrara marbles. It runs in blocks up to about 50 cubic feet, rarely over. It is the most economically worked of any of the statuary quarries. Poggio Silvestro is on the opposite side of the valley ; it is a fine marble, less transparent than Grestoli, and commands about equal prices. Betulia is a very white marble, and rather opaque ; has a sugary appearance, with a small bright sparkling crystal ; it works very easily under the chisel, and takes a good polish, but it is cold in tint. It is rather subject to "moschini" (small black specks). It decays very fast in the open air, and no one should ever use it for work that is to be at all exposed. A very great deal of it is sent to England, and is used almost entirely for the cheap commercial sculpture of Carrara. It is but little used in Italy for works of importance. The quarry has been much improved of late years, and yields the largest blocks of any statuary quarry in Italy. The quality of the marble has also somewhat improved.

La Mossa (often called Pianella from its situation) is an excellent marble, and fetches as high a price as Grestoli when found in large sizes.

Polvaccio, like Grestoli, is worked in two quarries. The expense of working these quarries is very great. The only fault I have to find with it is the frequency of faint yellow lines that scarcely are perceptible until the work is well advanced. It fetches a very good price.

Binelli is a beautiful marble of the Grestoli character; it is very costly to get, as the blocks have to be raised from a great depth from the quarry before they can be again lowered down the drift to the road. It is rarely seen, except at the quarries, so perhaps it is usually confounded with Grestoli in the workshop.

The quarries of Sicilian, or, properly speaking, "Marmo Ordinario," are legion in Carrara. I shall therefore only mention one of the most remarkable, called La Piastra. It is situated at the junction of the Ravagioni valley and of the Canal Bianco, but in character it belongs to the latter. It is considered to be a model of what a marble quarry ought to be, and is remarkably well worked. The joints are nearly vertical, and very little powder is used in this quarry. The marble is very uniform in tints, and blocks of enormous size are obtained. The drift forms a platform about sixty yards square, on which is built a convenient shelter for the men, with even an attempt at a garden. The blocks are all squared up on this platform, loaded on sledges, and lowered over the drift, with ropes, to the loading-stage in the valley below. The ropes have to be renewed about once in three weeks. This marble fetches about 5s. per foot cube at the quarry.

After the marbles, the most important of the limestones to the sculptor is certainly alabaster. This material, however, seems to have been driven from the field in a great measure by the inferior Carrara marbles, and, indeed, it seems probable that had our predecessors in the art been able to have secured a plentiful supply of marble at a reasonable price, they would not have used alabaster as much as they did for ecclesiastical sculpture. In the present day little or no important work is executed in that material, which has chiefly passed from the hands of the sculptor to those of the architectural carver. I am more than half inclined to regret this, as alabaster is pleasant to work and admits of a high degree of finish. It also lasts remarkably well when protected from the weather. The best is quarried in the neighbourhood of Volterra, and is carved into all manner of vases and figures,—usually sad rubbish,—which is purchased as a souvenir by the too-indulgent traveller.

The next in rank are the oolites and the dolomites, or magnesian limestones. These latter we may soon dismiss. They are too perishable to be placed in exposed positions, and although they might do very well for interior work, they have so little to attract the sculptor that they may well be left to the architectural carver. It is said, indeed, that when the carbonates of lime and of magnesia are present in nearly equal proportions, they approach more nearly to the character of marble. But, granting such to be the case, we had still better use marble.

Of the oolites those best known to the sculptor are the Portland and Bath stones. They both allow of a certain amount of finish, as much, perhaps, as is desirable in large work. Bath stone is hardly suited for work that is to be placed in the open air, and, perhaps, it is hardly good enough for much else. Portland stone of really fine quality is for outside work hardly to be surpassed, but it varies very much in this respect. It is a pity that merchants, workmen, and employers all seem to prefer a stone that can be rapidly and cheaply worked to one that has qualities promising greater durability. The well-known Caen stone from Normandy belongs to this family, but is too soft to be of much use where it is exposed, though it is very largely used in France. It hardens, indeed, to some extent by exposure, but it is better employed where frost and rain cannot get at it. The last of the oolites which I have to mention is lithographic stone. This beautiful stone is extremely durable and can be finished to any required degree of delicacy. It does not work well at all under the chisel, and should be finished with the graver. It is tedious work and yet it is well worth the labour. The work when finished should be well oiled to bring out the colour. I have only used it for medallions, unfortunately it is not to be had in sizes large enough for anything more important.

Next and last come the sandstones. These are, I believe, very little used in this country except where the red sandstone has been carved for architectural decoration, as, for instance, in the abbey at Arbroath. In Germany, on the contrary, and especially in Saxony, a very great use has been made of this material, which is quarried of very fine quality and in very large sizes in the valley of the Elb, within a few miles of Dresden. As examples of the excellent work that may be done in this material I may mention the groups by Professor Schilling, of Morning, Evening, Noon, and Night, which adorn the steps of the Brühlische Terrace, and the statue of Raffaelle, by Professor E. Hähnel, on the Picture Gallery at Dresden.

The next materials to be considered are the metals, and these are, indeed, of great importance to the sculptor, though, for some reason or other, it is rarely that a sculptor at the present time does any metal-work himself. He is usually satisfied to hand it over to the manufacturer, who makes a more or less accurate copy of his model to the destruction of its value as an autograph work.

I freely admit that it is at times impossible for a sculptor to be his own founder and metal-worker. Where large work is concerned the premises and appliances required are far beyond what is to be found in a sculptor's studio, and although in the old days men like Michelangelo and Benvenuto Cellini did not disdain to cast their own works, and, even in our own time, sculptors have occasionally set up a foundry as an adjunct to the studio, it has been the exception and is, I fear, hardly likely ever to become the rule. Nevertheless, works of cabinet size may be executed in metal, without much inconvenience, in the sculptor's studio, and surely a sculptor who does not understand metal-work and casting is ignorant of a very important branch of his profession, and is at the mercy of the workmen or manufacturers whom he may employ. I trust the time is not far distant when the public will awake to the importance of autograph work in sculpture, and will insist on having it, at least in so far as cabinet works

are concerned, and that the much-vexed question of legitimate assistance may be at last set at rest.

The metals chiefly used by the sculptor are copper and its various alloys, iron, lead, and zinc. To this list may be added gold, silver, and aluminium, but these are, of course, uncommon.

Pure copper has been much used for sculpture, where it was desired to produce works of little weight. In this case the statue was composed of beaten plates of copper, and mounted on an iron framing. At the present moment, only three examples of important works of this description occur to my mind, and, curiously enough, the two last no longer exist, having been destroyed by fire. These three are the equestrian statue of Augustus the Strong, Elector of Saxony and King of Poland, in Dresden; and the other two were the equestrian statue of the Constable de Montmorency at Chantilly, and the Quadriga, with the figure of Brunonia, in front of the Ducal Palace at Brunswick. It is probable also that most of the gigantic statues of antiquity were of wrought copper, not cast bronze. The advantage would be economy in metal, and also in facility of construction. For most purposes, however, the sculptor will find cast bronze the most convenient material. There are, of course, many different copper alloys that are called bronze, but, properly speaking, the term should be applied only to alloys of copper and tin. The proportions vary considerably, but in no case should the tin exceed 10 per cent., which, to my mind, is already too large a proportion. All founders have their own favourite mixture, and probably have good reason for preferring it to that used by another. Founding is so nice an operation that when a founder has by practice found an alloy that suits him, and knows the exact degree of heat at which he obtains the best results, it is natural and right that he should not care to adopt other mixtures. Many founders do not care to use pure bronze for sculpture, but prefer some admixture of zinc and even lead. Keller used both zinc and lead, as well as tin, in his bronzes, which are of remarkably fine character. In England, it is not uncommon to use a mixture of gun-metal and yellow brass. This flows very well, and is an excellent metal for many purposes. The worst practice of all, and one that is very prevalent in Italy, is to use a mixture of old scrap brass of every description. This, of course, is not done by such founders as Galli or Nelli, but is a common practice in most of the small foundries. The metal resulting from this is, of course, very unreliable as to quality and colour, and is often extremely difficult to chase.

Lead and zinc have been much used for sculpture, but lead is probably of all materials the worst, being too soft even to carry its own weight. Zinc is better in this respect and casts very well, and is much used in Germany as a cheap substitute for bronze. It is, however, at best only a makeshift, cast zinc being too weak and brittle for sculptural purposes. Aluminium is a far better material, but unfortunately its prime cost is too considerable to make it generally available. It melts at a comparatively low temperature, and produces beautifully clean castings. It forms an excellent bronze when used as an alloy for copper.

Last of all we come to iron,—a material which until recently has been much neglected by sculptors, and, indeed, is but little used even now, though there are not lacking examples of what may be done in this metal both in our streets, as, for instance, the candelabra at Northumberland-avenue and in our museums, which contain beautiful examples of iron casting. It seems to me to possess many advantages for colossal work especially. It is cheap and durable, and no statue in iron is likely to come to the melting-pot for the sake of the metal, a fact that has befallen so many fine bronze statues. I see no reason why nine-tenths of the monuments in London would not have been quite as effective in iron as they are in bronze, and holding this opinion I am executing an important public monument in iron at the present time, and I have little doubt that before long iron will be quite as much employed for this class of work as bronze if it does not drive the latter entirely from the field. For works of medium size bronze is, of course, the finer material. In concluding these few remarks on materials, I must crave forgiveness if I have omitted some, and have, perhaps, done scant justice to others. Each of the more usually employed materials would demand an article to itself if the subject is to be treated otherwise than superficially. This would involve also the various processes for which they are used, and would, in fact, become a treatise on sculpture itself.

THE BEAUMONT TRUST BUILDING SITE.

WE recently adverted * to a proposal for establishing in the East End of London, in connexion with the Beaumont Trust, a people's palace of industry and diversion. In furtherance of that scheme Lord Rosebery engages to bear the cost of a swimming-bath; the Duke of Westminster, the Clothworkers' Company, and Mr. Tate, contribute 1,000*l.* each; and the Drapers' Company have promised 20,000*l.* if an equal amount shall be forthcoming for the library and reading-room. The Charity Commissioners offer to sell for 22,400*l.* the site of Bancroft's Hospital, being about 4½ acres in area, at Mile End.

In St. Helen's Church, Bishopsgate, stands the vault which Francis Bancroft, grandson to the archbishop of that name, caused to be erected in the year 1723. Dying in 1727 he enjoined that his remains should be embalmed and exposed to view, and that his tomb should be visited by each newly-elected master of the Drapers. The vault, now closed, long formed an object of curiosity with the vulgar. Having enjoyed no particularly enviable reputation when alive (it is said the church bells were rung for joy at his death), Bancroft sought to make his peace with the world by his manner of leaving it. First providing for the care of his body, he gave nearly all his personal and real estate in trust to the Drapers' Company, computed by him to be worth 28,000*l.* His property lay mostly in Prittlewell, Dunmow, with other Essex parishes; in Rayson, Hadley, and Layham, Suffolk; in Chiswick, St. Giles's-in-the-Fields, St. Margaret's, Westminster, and in St. Gregory parish, Castle Baynard Ward. He directed the Drapers to devote from 4,000*l.* to 5,000*l.* out of his personal estate to purchasing a plot of ground in or near London, and the building thereon of almshouses for twenty-four old men, together with a chapel and school-room for 100 poor boys, and separate dwelling-houses for two masters. Each beadsman was to be paid 8*l.* a year, and to receive an allowance of coals, with a baize gown every third year. In 1735 the executors handed over the residue of the personal estate, to the extent of 23,127*l.* 8s. 6d. to the company, who forthwith expended nearly 6,300*l.* in erecting the buildings, to which six more almshouses were subsequently added. The trusts now yield an income, from all sources, of about 7,500*l.* per annum. Besides the real estate already mentioned several properties in London contribute to the income of this eleemosynary endowment. These latter are severally situated in St. Helen's-terrace (Nos. 1 to 6), Mile End; in the Poultry and Honey-lane Market; in Holborn (Nos. 273, 274, 276, and 277); and in Godliman-street (No. 9) and Basinghall-street. Rent is also obtained from certain fee-farms issuing out of manors in Yorkshire, with that of Apsley Grange, Lincolnshire. The almshouses, which will thus be shortly removed, are a conspicuous feature on the northern side of the Mile End-road, a little beyond the cemeteries belonging to the Dutch and Portuguese Jews. The Beaumont Institution itself was originally established in the neighbouring square to which it has given its name. Mr. J. T. B. Beaumont died in 1841, endowing his institute with a capital sum of 13,500*l.* An apposite commentary upon the somewhat various purposes which the new Beaumont Trust will serve is supplied by a statement which a mission clergyman in this district has lately made. He insists upon the moral and material value of men's clubs, and says:—"For our boys we are very lucky; we have got for them an excellent club; upstairs there is a quiet room for games, downstairs a first-rate gymnasium. A gentleman comes once a week to teach them to box: we do not bring them up on Dr. Watts's hymns."

* *Vide* the *Builder* (27th June, 1885), vol. xlviii., p. 895.

NOTES.

THE alarms of earthquakes are becoming too numerous and too near for us to disregard them, or treat them as phenomena only remotely possible. The record of the last month's seismology shows that the earthquake influence, which reached such a terrible pitch at Krakatoa, in the island of Java, is not only far from being exhausted, but is travelling with increased intensity towards European and English areas. The Cashmere disturbance, in which over 70,000 buildings were destroyed at the beginning of June, is being repeated, while in France a severe shock was experienced only a fortnight ago. This has been followed by earthquakes in Yorkshire, the effects of which were felt from Leeds to Driffield; also on the same day in Argyllshire, and a day or two later, in the localities of Friburg and Geneva, while on July 1st, the whole Lake District in the neighbourhood of Ambleside and Grassmere underwent the same paroxysms. Worse than all this, we are promised by M. Delaunay, a seismic prophet who, so far, has been remarkably correct in his prognostications, that the year 1886 will be marked by earthquake disturbances of extreme intensity. We read of such occurrences with considerable composure when they happen a long way off; but when our own walls are tumbling about our ears, we shall begin to understand the terrible alarm that is constantly present with populations in tropical centres. Perhaps the threatened earthquakes of 1886 may indirectly do us a good turn by bringing down the badly-constructed houses of the jerry builders, which assuredly were never meant to stand such rough usage.

THE case of Saunders *v.* Pawley, tried last week by Mr. Justice Day and a special jury, is, perhaps, the most encouraging to sanitary reformers of any of the cases which have lately come into the law courts. We print a short report of the case in another column, but it is very important as showing how careful house-owners will in future have to be in regard to drainage matters. The two main faults were bad joints to a soil-pipe, and a broken trap to a rain-water pipe. At the same time, it has to be borne in mind that the jury found that the owner of the house, whom we regret to find is a practising architect, falsely alleged that the house was in a perfect sanitary state. We believe that many such false representations are made recklessly, but yet not with a fraudulent intent, but sufficiently without care to amount in law to false representations. Mr. Pawley is condemned in damages to the amount of 2,228*l.* odd, not to speak of costs, so that with this verdict before their eyes it is to be hoped that owners of houses will take care that the drainage of their houses is in a proper state before they let them to tenants.

THE question of the safety, or, rather, the non-safety, of the National Portrait Gallery, brought to mind again by the recent fire at the Inventions Exhibition, was the subject of the first communication made to Parliament by the new First Commissioner of Works, Mr. Plunket, on Tuesday last. In reply to Mr. Coope, the First Commissioner said, "I have for some days been inquiring into it, and I am glad to be able to inform him that the actual danger to the National Portrait Gallery is not as great as his question seems to imply. The building is of ordinary construction,

with brick walls and wooden joists and floors; the roof is slated, and has skylights; it is not covered with tarred felting; and it is separated from the wooden corridors outside by brick walls and iron doors; it cannot be said in any sense to be in an equally hazardous condition with the International Exhibition, which is built entirely of wood, covered with asbestos paint." Mr. Plunkett admitted, however, that the risk of fire is increased by the proximity of the Exhibition building, and promises further suggestions. There ought of course to be a new building on another and less dangerous site.

A LETTER from Mr. G. H. Leane, F.S.I., in the *Times* of Saturday last, drew attention, in by no means too strong terms, to the unsatisfactory nature of the provisions of the "Corporation of London Tower Bridge Bill," which provides that "the bridge shall be continuously open during such period at or about the time of high water as the Corporation shall from time to time direct," the clause further empowering the Corporation to open the bridge at any other time of the tide when the navigation of a vessel would be prevented or delayed by the interposition of the bridge. It seems difficult to understand how any people in their senses can propose a bridge Bill with such provisions, or imagine that it will be sanctioned. A bridge which may be interrupted or closed to land traffic at any time, and which must be so for a considerable period, at constantly varying times, twice in every twenty-four hours, is simply useless for such traffic as it is required to provide for; and we hope money will not be allowed to be spent on any such absurd project. Whatever communication be provided across the river east of London Bridge, it must be a permanent road, either under the river or over it; nothing else will be worth the cost of making.

THERE are probably not many places in England in which the almost obsolete system of government by vestry prevails, and the proceedings, financial and otherwise, of the Richmond Select Vestry, must make the inhabitants of that once pleasant little town seriously consider whether they could not with advantage change their form of administration for one that is more satisfactory and in keeping with the times. Local Government Board enquiries have been ominously numerous in Richmond of late years, all, of course, tending to one end,—that of borrowing,—the vestry being in the habit of incurring the expenditure for works (many of which have been failures) before obtaining sanction for such expenditure. The consequence of this laxity is that the rates are to be raised from 4s. 6d. to 5s. 6d. in the pound. The water-rate that forms part of this charge is to be increased from 1s. to 1s. 4d., a pleasant reflection for the ratepayers who, a few years ago, were induced by the promise of a 6d. rate to approve of the undertaking of the now notorious Richmond well, which, from first to last, has cost nearly 70,000*l*. In the course of this last official inquiry, bitter complaints were uttered at the impossibility of ratepayers obtaining information from the water committee as to the condition of the accounts; and the generally secretive policy of the vestry may be gathered from the fact, that out of the hundred bills ordered to be printed to announce the holding of the inquiry, only seventeen were posted, and the remaining eighty-three used as waste paper by the parish beadle. It is to be hoped that the agitation in favour of a corporation will again be set on foot, as offering a chance of obtaining better government.

A SOMEWHAT interesting event in the world of art will be the Exhibition of English Water-colours which it is intended to hold in Boston, Massachussetts, in the autumn of this year. The Exhibition will be under the management of the Trustees of the Museum of Fine Arts at Boston, and is to open in October next. The works will be admitted free of duty for six months (the period during which the Exhibition will be open), and the Cunard Company will transport them, carriage free, by their steamer *Pavonia* on the 2nd of September. The number of drawings to be sent is limited to 500. We hope the English water-colour school, in which branch of art, at all events, England is at present *facile princeps*, will be thoroughly well represented at Boston. Taking the best productions of a few years, we ought to be able to send Boston a collection of 500 masterpieces. Information as to the Exhibition can be obtained from Mr. Henry Blackburn, the Hon. Secretary, 103, Victoria-street, S.W.

IT is understood that Count Gleichen is engaged on a marble statue of the Queen, to be placed in the first quadrangle of the Holloway College for Women at Egham, and a group of the founder and his wife, to be placed in the second quadrangle of the same institution. In commemoration of the opening of the Holloway Sanatorium on the 15th of June last, the Prince and Princess of Wales have also consented to give sittings to Count Gleichen for busts, which are to be placed in the great hall of the Sanatorium.

THE Duchess of Westminster laid the first stone last Saturday of a very large Assembly-room in Mile End-road, for Sunday evening services in connexion with the Tower Hamlets Mission. The building is to accommodate 5,000 persons. Taking this in connexion with the "Palace of Delight," to be erected out of the Beaumont Trust Fund, there seems to be considerable provision being made both for the spiritual and the mental health of the inhabitants of East London, though there is room for much more to be done still. Mr. Charrington is the promoter of the Assembly-rooms scheme, the funds for which are being raised by subscription.

THE remaining portion of the pictures and sketches by the late Louis Haghe were sold by auction by Messrs. Christie, Manson, & Woods, on Friday and Saturday last, and realised for the most part only moderate prices. The works sold consisted chiefly of sketches in Belgium, France, and Italy, and studies for pictures in water-colour and oil, with a few finished drawings. Two large studies for the picture of the "Death of Jean Goujon" fetched only 4 guineas; an interior of the Mosque of Santa Sophia, 21 guineas; an interior of St. Anne's Church, Bruges, 20 guineas; Quentin Matsys's Well, Antwerp, 17½ guineas; and others in like proportion. A highly-finished drawing of the interior of the painter's studio, with several portraits, realised 58 guineas.

THE Liverpool Architectural Society have addressed a memorial, of which a copy has been forwarded to us, to the Chairman of the Insanitary Property Committee of the Corporation of Liverpool, in regard to the conditions of a competition advertised by that Committee for a large block of labourers' dwellings. The memorial draws attention to these points:—(1) There is no mention of a professional adjudicator, and hence 1,450 architects in the United Kingdom are debarred, by their own pledges, from competing. (We fancy this will be a new light to the Committee); (2) The amount of premiums offered is quite inadequate for a building to cost 40,000*l*. (The highest premium appears to be 50*l*.); (3) Designs for which premiums have been adjudged ought not to become the property of the promoters. (In this we entirely concur, unless the promoters pay at a much higher rate than competition premiums generally amount to); (4) That the instructions are inadequate, saying nothing as to scale of drawings (!) or whether or not perspectives will be admitted; (5) that the architects are asked to provide remunerative dwellings under conditions rendered impossible by the Corporation's own By-laws; and (6) that there should be some guarantee that the successful architect will actually be employed, a condition which the past history of architectural competitions in Liverpool renders it necessary to emphasise. The fifth objection is matter for argument; the Corporation Committee may think there is a chance of discovering some genius who will cause two-and-two to make five-and-three-quarters instead of four; but in every other respect the memorialists are in the right, and the profession ought to be obliged to them for making a stand against what appear to be very unsatisfactory conditions for an important competition.

THE "Home Arts and Industries" Association, to which we referred in a "note" recently, has been holding an exhibition this week at 3, Carlton House-terrace, by Lady Brownlow's permission, showing some of the work which has been done by lads in the country and in London under the encouragement and training of members of the society. The exhibits of wood-carving were the most numerous, and some of them showed great aptitude and promise for beginners. At present there is rather a want of aim about the work; the society has only been in existence a few months; but it is hoped that much has been done to awaken an interest in home art, and to lead in time to the making of common things for actual use in such a way that they may become a source of enjoyment to the makers and to those who use them when made.

SOME of the Liverpool architects are about to follow the example of the Architectural Association and institute a "sketch-book" for the publication, in lithographed form, of sketches under the title "The Draughtsman's Sketch-Book." Mr. T. J. Dalziel is the editor. Some of the leading contributors are members of the Liverpool Architectural Society, but we do not gather that the intended publication is in any way formally connected with that society.

THE autobiographical record of Mr. Artemus Ward commenced, if we remember right, with a copy of a model letter to be written to the editors of the newspapers of any town in which his celebrated "moral waxworks" were intended to be exhibited, the most emphatic sentence in which was somewhat to this effect:—"I tell yer that I intend tu hev all my advertisements in yoor kollums, and all my poasters printed to yoor printin' werx." Artemus seems to have left what he would probably have called a "brite eggsampul" to not a few inventors and purveyors of building materials and appliances, who favour us with diplomatic letters inviting our attention to their contrivances, accompanied by assurances which only differ in the minor matter of orthography from that of the astute Mr. Ward. Perhaps it will save these diplomatic correspondents a little trouble if we explain, once for all, that whatever facilities for that kind of *quid pro quo* arrangement may be found in some other quarters, they will be wiser, in asking for our support, to confine themselves to proving that they have something really good to introduce to the public. Those who can convince us of that will always have our ready support; those who cannot must be content without it.

Paisley Baptist Chapel.—In our last issue [p. 8, *ante*], in giving a review of the drawings in the above competition, we should have said that Mr. Charles Bell, of London, was one of the six architects originally selected to compete, though by an oversight of our contributor his design was passed over at the time. Mr. Bell's plan is designed for Congregational worship, so that all can see both pulpit and baptistery, a point overlooked by some of the other competitors. The nave is treated in one span, with no columns to intercept the view, and there are wide transepts with a groined dome at the crossing. The arrangement for securing privacy after baptisms is to be commended. The style of architecture is Early English; the front elevation has a boldly-treated gable flanked by a well-proportioned tower and spire. The difficulty of approaches has been well met,—a carriage drive being arranged both to reach the central entrance in Design A, or the side entrances in Design B.

Fig. 1.

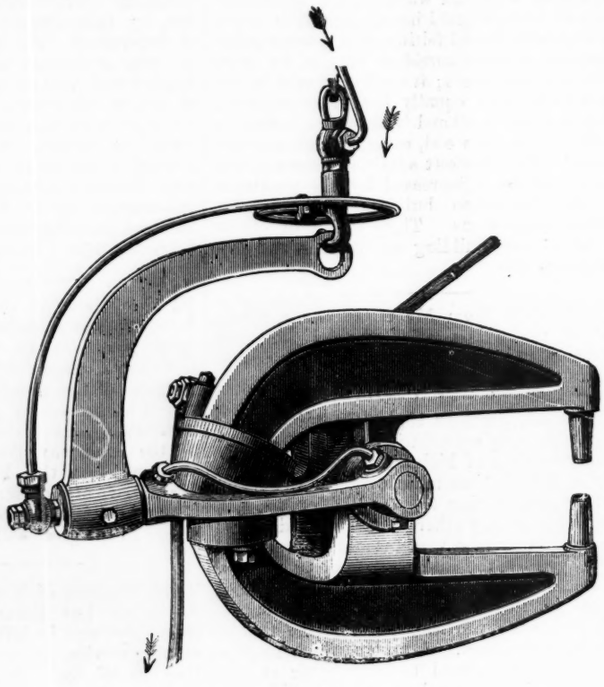


Fig. 2.

MACHINE TOOLS AT THE INVENTIONS EXHIBITION.

HYDRAULIC RIVETERS.

IT is only within the last few years that the full importance of hydraulic power for the purpose of working machine tools has been generally recognised, and no doubt this recognition would have been still further delayed had not the growing demands of the marine engineer for higher steam-pressures forced boiler-makers to use every exertion in endeavouring to obtain the highest results in both workmanship and material. In 1871 Mr. R. H. Tweddell, who has done more to advance this system than any one else, made his first hydraulic riveter, and since then, in the face of much opposition, has so far succeeded in his mission as now to have more than 800 machines at work in different parts of the world. For some time Mr. Tweddell was unable to find a firm of manufacturing engineers who would take the question up, but at last in Messrs. Fielding & Platt, of Gloucester, he met with those who had the intelligence to see the value of his scheme, and the enterprise to follow it up in a liberal manner.

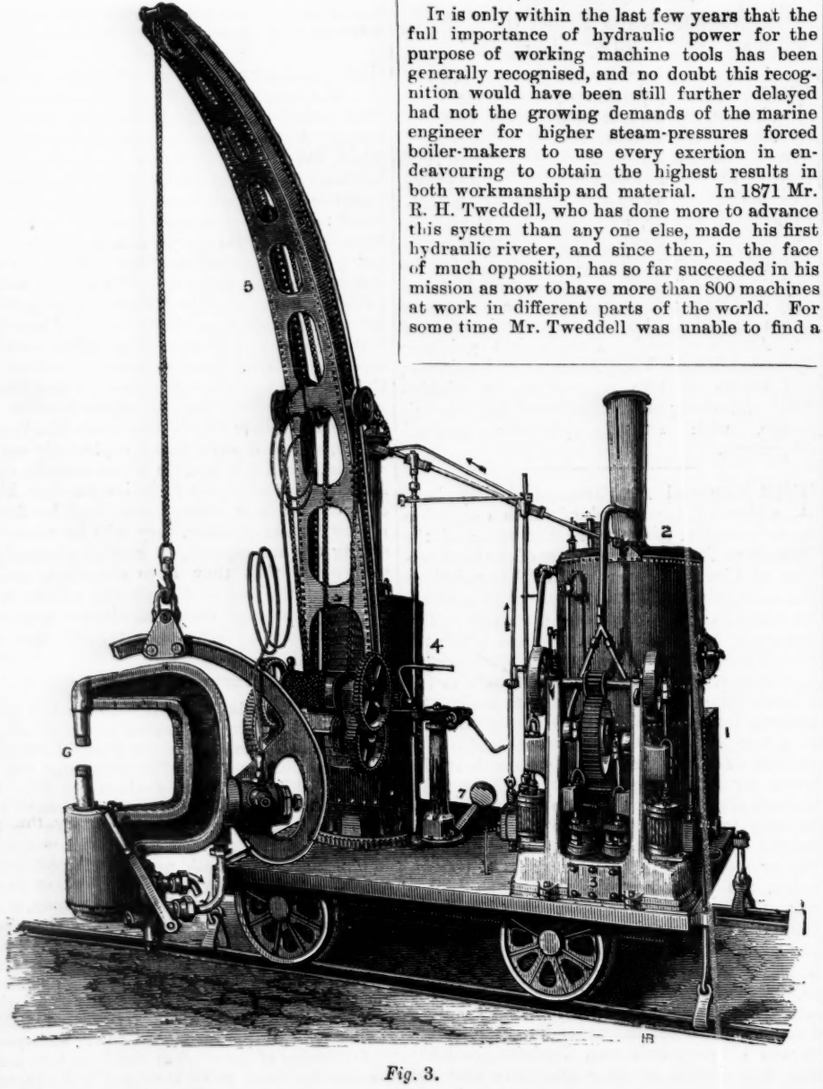


Fig. 3.

At the Inventions Exhibition this firm has a large stand, upon which some of the most important hydraulic tools they manufacture are exhibited. The water for the supply of the tools, which are shown in action, is drawn from a small overhead tank and pumped by a pair of powerful pumping-engines into a hydraulic accumulator. These engines have been specially designed for the work in question, and the accumulator is constructed so that the pressure can be easily varied through throwing one or more of the weights out of use by supporting them on the framework in which they are guided. The arrangement by which the engines are stopped and started when the accumulator either wants pumping up or reaches the top of its stroke is different to the ordinary gear used for this purpose. To shut off steam from the engine a specially-designed stop-valve is used. The valve-spindle is, at the same time, a small hydraulic ram, and when water at pressure is admitted beneath this the valve is withdrawn from its seating, admitting steam to the cylinders. The admission of water to effect this object is controlled by a two-way cock worked by tappet-gear, which, in turn, is brought into action by the rising or falling of the accumulator. This arrangement appears to be simple and effective, and is, no doubt, an improvement on the old style of tumbling and trip gear. From the accumulator a main is carried beneath the floor to the different machines. The general arrangement in actual work is for the exhaust main to be placed in the same trench as the pressure water-pipes, but at the Exhibition the exigencies of the stand do not allow of this.

The first machine to be noticed is a double-ended and double-power portable riveter, which we illustrate in fig. 1. This was the subject of Mr. Tweddell's first patent as a portable riveter, and, although since this was brought out many other forms of machine have been introduced by the inventor, it is still unsurpassed for use in special bridge girder work and for railway wagon and carriage underframes, &c. The general arrangement is well shown in our illustration.

A second form of machine is that shown in fig. 2. It is known as the Fielding type of riveter, and is well adapted for bridge, girder, and ship work. In consequence of the cylinder being well out of the way the machine is very convenient for working in very confined spaces, such as the corners in girders and the intercostals of ship work. In order to illustrate this

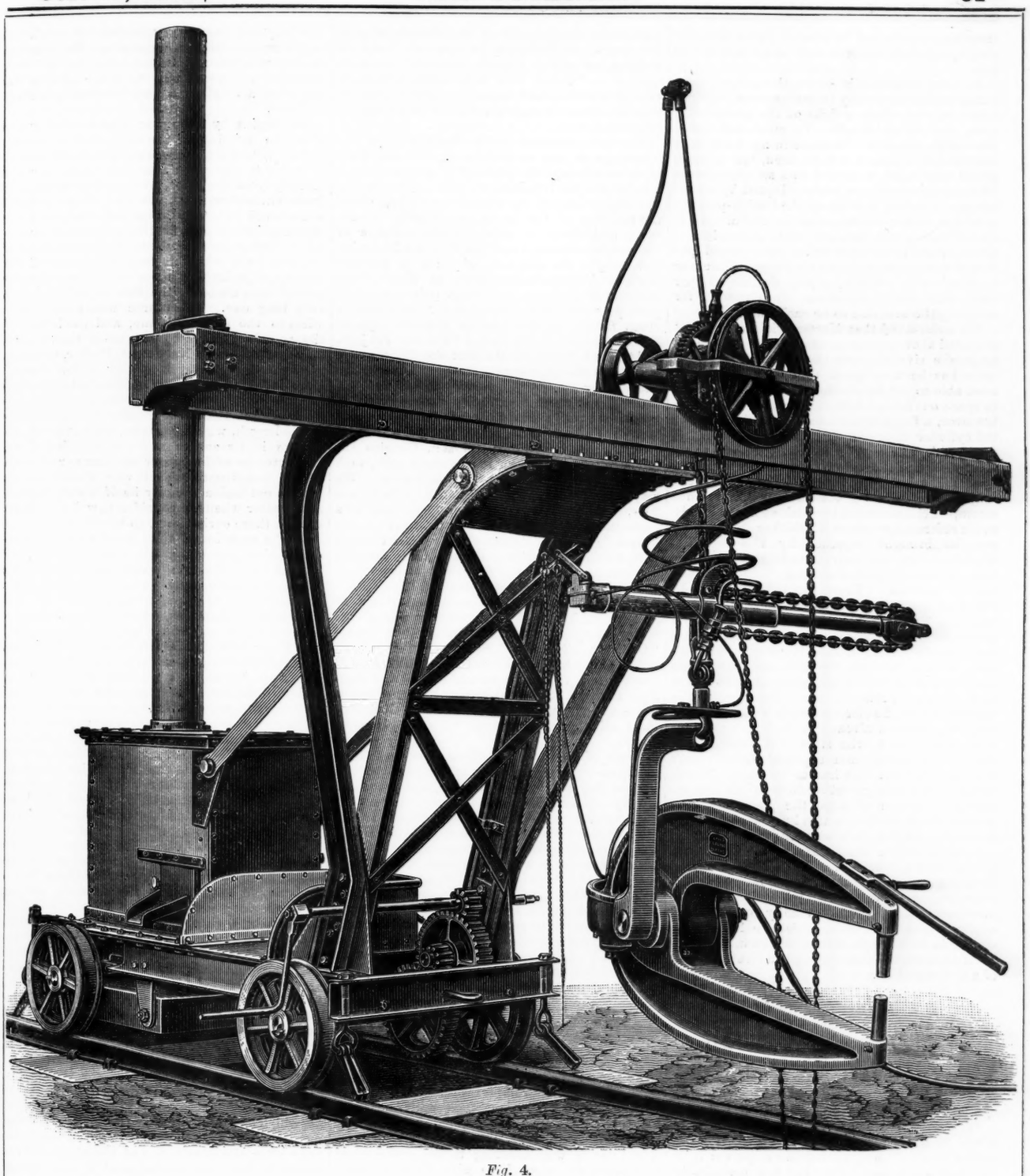


Fig. 4.

more fully a portion of the floors and keel of a ship has been introduced into the exhibit. The most noticeable feature in this machine is the arrangement of ram and cylinder, which are, as may be seen by the illustration, respectively turned and bored to a curve struck from the centre of the gudgeon upon which the arms rock, so that the travel of the ram is through an arc having a radius corresponding to the distance of the axis of the ram from the centre of the fulcrum formed by the gudgeon. The machine has the appearance of being difficult to manufacture, and in ordinary circumstances doubtless this would be the case, but Messrs. Fielding & Platt have designed special machinery for boring and turning these curved parts, and they say they can now construct the rams and cylinders for these machines as easily as if they were straight. The advantages of the design are very apparent, the chief being that the ram and cylinder form a substantial guide for the arms, each of which can be cast in one piece with them respectively, thereby insuring rigidity and steady work. Any swerving, through side strains on the arms caused by the heads of the rivet not being quite opposite each other, is in this way prevented.

On this same section of a ship's bottom a keel-riveting machine is also shown. In no other position is the advantage of machine riveting more apparent than in the heavy work required for closing the rivets in the keels of large vessels. In the largest ships this riveting can hardly be done by hand. This was especially found to be the case during the construction of the *City of Rome*, the *Alaska*, and the *Servia*, on all of which vessels a machine of the type exhibited was used. We may mention that the example of the work shown represents the *Servia's* keel and garboards. The machine is carried on a travelling-carriage, which runs on lines laid under the ship's keel. By means of a system of parallel balanced levers, the closing dies are brought up to the same height, and kept level so as to work fair. A swivelling motion can be given to the machine, so as to take work which is not quite square to the line of travel of the apparatus.

In fig. 3 we give an illustration of one of Tweddell's portable riveting plants, specially adapted for riveting up bridges *in situ*. It will be seen that the whole apparatus, consisting of boiler, engines, pumps, accumulator, crane, and rivet furnace, is all mounted on a trolly, thus enabling the whole to be moved about bodily into any position in a yard or on a bridge in course of construction. The fire which heats the rivets is also used for raising steam in the boiler, the waste heat from the rivet furnace being sufficient to supply the power for closing the rivets. The riveting-machine is of the bear type, and is shown suspended from a lofty crane, which may be turned round the centre of the accumulator, or can be adjusted to rake when required. The flexible copper piping allows the machine to be raised and lowered or swung about in any position without the connexion to the accumulator having to be broken. Two, three, or more machines are often worked

from water supplied by one of these portable plants, which have come very much into use of late.

In some instances, however, the nature of the construction, especially in bridge work, will not admit of the whole weight of the plant being upon one set of wheels. To meet such cases, the design which we illustrate in fig. 4 has been introduced, where, it will be seen, the motive-power machinery is carried on a separate truck. This arrangement was lately adopted by a contractor, who had to rivet up the buckle-plate in a bridge under construction in India. It is stated that in this instance, with native labour alone, upwards of 4,000 rivets were closed per day of ten hours with one machine. The crane is fitted with walking-pipes, flexible copper tube, and many ingenious contrivances for enabling the machine to be easily moved.

We understand that Messrs. Fielding & Platt intended showing one of their large stationary hydraulic riveters, but the demand for these tools has been so great that they have never been able to get far enough ahead of the work to spare one for exhibition purposes. There is, however, a full-size sectional working model of the cylinder of one of these machines; and no doubt this will convey to most people a more definite idea of the action of the mechanism than the machine itself would have done. To meet the exigencies of riveting boilers for high-pressure steam,—a circumstance to which we have already made reference,—plates of thicker gauge than can be brought together by the ordinary machines are necessary, and the form of tool under consideration has been designed for the purpose. There are two powers. In the first operation a ram is brought forward which is fitted with a cage that encircles the rivet, and this effectually brings the overlapping parts of the plates closely together. Another ram is then brought forward, and this closes the rivet, after which the pressure which was on the plates is relieved from the cage, but is transferred to the closing dies in addition to the original pressure already on them. This gives a final squeeze to the rivet, and perfects the work with a minimum expenditure of power for the stiff work that has to be done. Specimens of very heavy riveting done in this way are shown. In one of these the piece has been planed through the centre line of rivets, and certainly nothing could be more perfect than the manner in which the holes are filled and the plates closed together. Models of forging, flanging, and other presses are shown, and also photographs of different applications of the machinery. There are also many details in the application of the tools, which we have been unable to dwell upon, but which cannot fail to be of interest to those engaged in riveting work of any description.

HISTORIC GRANTS OF ARMS.

WE believe it was Victor Hugo who said that the history of the latter half of the Middle Ages was as clearly written in the blazon of heraldry as that of the first half was in the symbolism of the Roman Church.

It is with the heraldic period that we are about to treat, and the truth of the French author's remark is nowhere more apparent than in "Augmentations" (as they are technically termed), or bearings added to coats of arms by favour of the sovereign as a reward for acts of valour or loyalty, or from any other cause more or less worthy of such a distinction.

To our mind there is nothing amongst all these historic charges that can claim a more romantic origin, or one more honourable to its possessors, than the crowned heart of the Douglas family. Robert Bruce, king of Scotland, had always wished to make a pilgrimage to the Holy Land, but it was not to be, and at his death he desired that his heart might be taken there, and buried within Jerusalem, and this task was performed by his faithful knight, "The Good Sir James" Douglas (the hero of some seventy battles), who loyally carried out his perilous duty (but was slain on his return by the Saracens in 1331), and thus earned for his descendants this most noble and appropriate addition to their shield. Boutell says that the crown was not added till comparatively recent times.

The Pelham buckle has been borne as a badge from time immemorial, so to speak, but early in the seventeenth century the following quartering was allowed the family to commemorate the capture of the French king at the battle of Poictiers by one Sir John de Pelham, of which exploit Froissart gives an account:—"Gules, two demi-belts, paleways, the buckles in chief argent." Lower tells us that sometimes a cage was added as an appropriate device.

We have referred to the Norfolk arms in a former paper, but omitted to say that the Earl, to commemorate the battle of Flodden, used as a badge for his retainers a white lion (one of the supporters of his shield) trampling down the red lion of the Scots and rending it with tooth and claw, an unmistakable instance of "history in blazon," and one that would doubtless delight the wearers of such a spirited device. Augmentations have at times been made to Englishmen by foreign potentates, but perhaps such grants have never been held in much favour by the bearers thereof. Queen Elizabeth was once appealed to on the subject, and replied, "that for her part she did not care her sheep should wear a stranger's mark, nor dance after the whistle of every foreigner."

Charles I. was a liberal dispenser of augmentations amongst his faithful followers, and many are the crowns, roses, and lions that we owe to this monarch. His son, Charles II., followed to some extent in the same path, such honours being about all he had to bestow. We may just record two of his grants to Carlos:—"Or, on a mount an oak tree proper; over all a fesse gules, charged with three regal crowns proper"; and to Penderell the same charges with a different colour. Both of these families assisted the fugitive king when he was concealed in the oak tree at Boscobel.

Through Jane Seymour's marriage to Henry VIII. her family were assigned the following quarter to their paternal shield:—"Or, on a pile gules, between six fleurs-de-lis azure, three lions of England." This monarch has contributed much to our badges and bearings through finding devices for his numerous wives and their relatives; but how paltry they must all appear compared with the Douglas Heart.

Some of the augmentations of recent times are in exceedingly bad taste and unworthy of the heroes they are bestowed upon, and some are simply idiotic instead of historic, such as the one granted to a family to commemorate the feat of one of its members in writing the Lord's Prayer on the space of a fourpenny bit!

Lower records such abominations as landscapes and large letters, bomb-shells and bayonets, East Indians and American Indians, sailors and soldiers, medals and outlandish banners, figures of peace, and Grenadiers of the 79th Regiment, and adds "Could absurdity go further?" "Shades of Brooke, and Camden, and Gwillim, and Dugdale! what think ye of this?" "*Jam satis.*"

THE WATER SUPPLY OF ANCIENT ROMAN CITIES.*

As the supply of water to large populations is one of the most important subjects in connexion with sanitary matters, and one upon which the health of the populations to a very large extent depends, I have thought that it would not be uninteresting to the members of this Institute were I to give them a short account of some of the more important works carried out for this purpose by the ancient Romans, the great sanitary engineers of antiquity, more especially as I have had exceptional opportunities of examining many of those great works in Italy, in France, and along the north coast of Africa. Many of them are well known, and have often been described, but others,—and those, as we shall see, in many respects by far the most important,—have not received the amount of consideration that they deserve.

Of the aqueducts constructed for the supply of Rome itself we have an excellent detailed account in the work of Frontinus, who was the controller of the aqueducts under the Emperor Nerva, and who wrote his admirable work on them about A.D. 97.

It may be interesting in passing to mention that Frontinus was a patrician who had commanded with distinction in Britain under the Emperor Vespatian before he was appointed by the Emperor Nerva as controller (or, we should say, surveyor) of the aqueducts. He was also an antiquarian, and in his work he not only describes the aqueducts as they were in his time, but also gives a very interesting history of them.

He begins by telling us that for 441 years after the building of the city, that is to say, before B.C. 312, there was no systematic supply of water to the city: that the water was got directly from the Tiber, from shallow wells, and from natural springs, but that these sources were found no longer to be sufficient; and the construction of the first aqueduct was undertaken during the consulship of Appius Claudius Crassus, from whom it took the name of the Appian aqueduct. This was, as may be expected from its being the first aqueduct, not a very long one. The source was about eight miles to the east of Rome, and the length of the aqueduct itself rather more than eleven miles, according to Mr. James Parker, to whose paper on the "Water Supply of Ancient Rome" I am indebted for many of the facts concerning the aqueducts of Rome itself. This aqueduct was carried underground throughout its whole length, winding round the heads of the valleys in its course and not crossing them, supported on arches, after the manner of more recent constructions; it was thus invisible until it got inside the city itself, a very important matter when we consider how liable Rome was, in these early times, to hostile attacks.

It was soon found that more water was required than was brought by this aqueduct, and it was no doubt considered desirable to have tanks at a higher level in the City than those supplied by the Appian aqueduct. It was determined, therefore, to bring water from a greater height and from a greater distance, and the River Anio, above the falls at Tivoli, was selected for this purpose. The second aqueduct, the Anio Vetus, was no less than forty-two miles in length, and was, like the Appian, entirely under the surface of the ground except at its entrance into Rome at a point about 60 ft. higher than the level of the Appian aqueduct. Little search has been made for the remains of this aqueduct, and its exact course is not known, but during my examination of the remains of the subsequent aqueducts, at a place called the Porta Furba, near Rome, where the ruins of five aqueducts are seen together, and at, or close to, which point the Anio Vetus must also have passed underground, I was rewarded for my search by discovering a hole, something like a fox's hole, leading into the ground, and on clearing away a few loose stones which had, apparently, been thrown into it, and, putting my arm in, I found that it led into the *specus* or channel of an underground aqueduct; and, on relating this incident to the late Mr. John Henry Parker, the antiquary, who was then in Rome, and showing him a sketch of the place, he said that he had no doubt that I had been fortunate enough to discover the exact position of the veritable Anio Vetus at that spot.

These two aqueducts sufficed for the supply of Rome with water for about 120 years, for Frontinus tells us that 127 years after the date at which the construction of the Anio Vetus was undertaken,—that is to say, in the 608th year after the foundation of the city,—the increase of the city necessitated a more ample supply of water, and it was determined to bring it from a still greater distance. It was no longer considered necessary to conceal the aqueduct underground during the whole of its course, and so it was, in part, carried above ground on embankments or supported upon arches of masonry. The water was brought from some pools in one of the valleys on the eastern side of the Anio, some miles further up than the point from which the Anio Vetus was supplied; and the new aqueduct, which was fifty-four miles in length, was called the Marcian, after the Prætor Marcius to whom the work was entrusted. Frontinus also tells us the history of the other six aqueducts which were in existence in his time, viz., the Tepulan, the Julian, the Virgo, the Alsietine or Augustan, the Claudian, and the Anio Novus,—the last two being commenced by the Emperor Caligula and finished by Claudius, because "seven aqueducts seemed scarcely sufficient for public purposes and private amusements"; but it is not necessary for our purpose to give any detailed account of the course of these aqueducts; it is only necessary to mention one or two very interesting points in connexion with them.

* An address delivered at the Anniversary Meeting of the Sanitary Institute of Great Britain at the Royal Institution, Albemarle-street, July 9th, by Professor W. H. Corfield, M.A., M.D. (Oxon), Hon. Assoc. Inst. Brit. Arch.

In order to allow of the deposit of suspended matters, piscinæ or settling reservoirs were constructed in a very ingenious manner. Each had four compartments, two upper and two lower; the water was conducted into one of the upper compartments, and from this passed probably by what we should call a standing waste or overflow pipe, into the one below; from this it passed (probably through a grating) into the third compartment at the same level, and thence rose through a hole in the roof of this compartment into the fourth, which was above it, and in which, the water, of course, attained the same level as in the first compartment, thence passing on along the aqueduct, having deposited a good deal of its suspended matter in the two lower compartments of the piscinæ. Arrangements were made by which these two lower compartments could be cleaned out from time to time. The *specus* or channel itself was, of course, constructed of masonry, generally of blocks of stone cemented together, and it was frequently, though not, it would appear, always lined with cement inside. It was roofed over, and ventilating-shafts were constructed at intervals; in order to encourage the aëration of the water irregularities were occasionally introduced in the bed of the channel.

The water supplied by the different aqueducts was of various qualities; thus, for instance, that of the Alsietine, which was drawn from a lake about 18 miles from Rome, was of an inferior quality, and was chiefly used to supply a large *naumachia*, or reservoir in which imitation sea-fights were performed: while, on the other hand, the water of the Marcian was very clear and good, and was therefore used for domestic purposes.

Frontinus gives the most accurate details as to the measurements of the amount of water supplied by the various aqueducts, and the quantities used for different purposes. From these details Mr. Parker computes the sectional area of the water at about 120 square feet, and says "We can form some opinion of the vast quantity if we picture to ourselves a stream, 20 ft. wide by 6 ft. deep, constantly pouring into Rome at a fall six times as rapid as that of the River Thames." He considers that the amount was equivalent to about 332 million gallons a day or 332 gallons per head per day, assuming the population of the city to be a million.

When we consider that we in London have only thirty gallons a head daily and that many other towns have less, we get some idea of the profusion with which water was supplied to ancient Rome.

But the remains of Roman aqueducts are not only to be found near Rome. Almost every Roman city, whether in Italy or in the South of France or along the north coast of Africa, can show the remains of its aqueduct, and almost the only things that are to be seen on the site of Carthage are the remains of the Roman water-tanks and the ruins of the aqueduct which supplied them.

The most beautiful aqueduct bridge in the world, on the course of the aqueduct which supplied the ancient Nemausus, now Nismes, still stands, and is called from the name of the department in which it is, the Pont du Gard. It consists of a row of large arches crossing the valley, over which the water had to be carried, surmounted by a series of smaller arches, and these again by a third series of still smaller ones, carrying the *specus* of the aqueduct. This splendid bridge still stands perfect, so that one can walk through the channel along which the water flowed, and it might be again used for its original purpose.

There was, however, one city which, from the fact that a great part of it was situated upon a hill, was more difficult to supply with water than any of the rest, and which at the same time, from its size, its great importance, and the fact that it was the favourite summer residence of several of the Roman Emperors, and notably of Claudius, who was born there, and who had a palace on the top of the hill, must of necessity be supplied with plenty of water, and that, too, from a considerable height. I refer to Lugdunum (now Lyons), then the capital of southern Gaul.

A somewhat prolonged residence in this city on two different occasions gave me the opportunity of examining on the spot the remains of the aqueducts constructed there by the ancient Romans, and more especially of the one constructed by the Emperor Claudius, and so, as they are but little known, although by far the most remarkable of the Roman waterworks, I have thought that it would not be uninteresting to you if I were to give, with the aid of the diagrams I have prepared, a somewhat detailed account of them.

The city of Lugdunum was built by Lucius Munatius Plaucus by order of the Senate in A.U.C. 711. Augustus went there in A.U.C. 738, and afterwards lived there from 741 to 744. It was he who raised it to a very high rank among Roman cities. It had its forum near the top of the hill now called Fourvières (probably a corruption of *forum vetus*), an imperial palace on the summit of the same hill, public baths, an amphitheatre, a circus, and temples.

In order to supply this city with water, standing, as it did, on the side of a hill at the junction of two great rivers (now Rhône and Saone), it was necessary to search for a source at a sufficient height, and this Plaucus found in the hills of Mont d'Or, near Lyons, where a plentiful supply of water was found at a sufficient height, viz., that of nearly 2,000 ft. above the sea. From this point an aqueduct, sometimes called from its source the Aqueduct of Mont d'Or, and sometimes the Aqueduct of Ecully, from the name of a large plain which it crossed, was constructed, or, rather, two subterranean aqueducts were made and joined together into one, which crossed the plain of Ecully in a straight line still underground; but the ground around Lyons was not like the Campagna near Rome, and it was necessary to cross the broad and deep valley now called La Grange Blanche. This, however, did not daunt the Roman engineers; making the aqueduct end in a reservoir on one side of the valley, they carried the water down into the valley probably by means of leaden pipes, in the manner which will be described more at length further on, across the stream at the bottom of the valley, by means of an aqueduct bridge, 650 ft. long, 75 ft. high, and 28 ft. 6 in. broad, and up the other side into another reservoir, from which the aqueduct was continued along the top of a long series of arches to the reservoir in the city after a course of about ten miles.

In the time of Augustus, however, it was found that the water brought by this aqueduct was not sufficient, especially in summer, and as there was a large Roman camp, which also required to be supplied with water, situated at a short distance from the city, it was determined to construct a second aqueduct. For this purpose the springs at the head of a small river, called now the Brevenne, were tapped and conveyed by means of an underground aqueduct (known as the aqueduct of the Brevenne), which wound round the heads of the valleys, and after a course of about thirty miles is believed by some to have arrived at the city, but by others to have stopped at the Roman camp, and to have been constructed exclusively for its supply. I have here a diagram (after Flachéron) showing a section of this aqueduct, and this will give a very good general idea of the section of a Roman aqueduct where constructed underground. It will be seen that the *specus* or channel is 60 centimètres (or nearly 2 ft.) wide, and 1 m. 57 c. (or a little over 5 ft.) high, and that it is lined with a layer of 3 c. (or nearly 1¼ in.) of cement. It is constructed of quadrangular blocks of stone cemented together, and has an arched stone roof. It will be noticed also that the angles at the lower part of the channel on each side are filled up with cement; it appears also that this aqueduct crossed a small valley by means of inverted syphons.

But neither of these aqueducts came from a source sufficiently high to supply the Imperial palace on the top of Fourvières. Their sources are, in fact, according to Flachéron, at a height of nearly 50 ft. below the summit of Fourvières, and it was, therefore, considered necessary by the Emperor Claudius to construct a third aqueduct. The sources of the stream now called the Gier, at the foot of Mont Pila, about a mile and a half above St. Chamond, were chosen for this purpose, and, from this point to the summit of Fourvières, was constructed by far the most remarkable aqueduct of ancient times,—an engineering work which, as will be seen from the following description, partly taken from Montfalcon's "History of Lyons," partly from Flachéron's account of this aqueduct, and partly from my own observations on the spot, reflects the greatest possible credit on the Roman engineers, and shows that they were not, as has been frequently supposed by those who have only examined aqueducts at Rome, by any means ignorant of the elementary principles of hydraulics.

To tap the sources of a river at a point over fifty miles from the city, and to bring the water across a most irregular country, crossing ten or twelve valleys, one being over 300 ft. deep and about two-thirds of a mile in width, was no easy task; but that it was performed the remains of the aqueduct at various parts of its course show clearly enough. It commences, as I have said, about a mile and a half from the present St. Chamond, a town on the river Gier, about sixteen miles from St. Etienne. Here a dam appears to have been constructed across the bed of the river, forming a lake from which the water entered the channel of the aqueduct, which passed along underground, until it came to a small stream, which it crossed by a bridge, long since destroyed. After this it again became subteranneous for a time, and then crossed another stream on a bridge of nine arches, the ruins of some of the columns of which are still to be seen, and from these ruins it would appear that the bridge had, at some time or other, been destroyed, probably by the stream running under it having become torrential, and subsequently rebuilt; again it became concealed underground to reappear in crossing a small valley and another small stream, when it was again concealed by the ground, and in one or two places channels were even cut for it through the solid rock, after which it reappeared on the surface at a point where now stands the village of Terre-Noire, and where it was necessary that it should somehow or other cross a broad and deep valley. It ended in a stone reservoir, from which eight leaden pipes, descending into the valley, were carried across the stream at the bottom on an aqueduct bridge, about 25 ft. wide, and supported by twelve or thirteen arches, and then mounted the other side of the valley into another reservoir, of which scarcely any remains are now seen, from which the aqueduct started again, disappearing almost immediately under the surface of the ground to appear again from time to time crossing similar valleys and streams upon bridges, the remains of some of which may still be seen until it reached Soucieu, on the edge of the valley of the Garon, where are still seen the remains of a splendid bridge, the thirteenth on its course, nearly 1,600 ft. long, and attaining a height of 56 ft. at its highest point above the ground. The object of this bridge was to convey the channel of the aqueduct at a sufficient height into a reservoir on the edge of the valley. The remains of this bridge leave no doubt that it was purposely destroyed by barbarians; some of the arches near the end of it remain, while the rest have been thrown down, some on one side and some on the other, but happily the arches next to the reservoir, at the end of the bridge and on the edge of the valley, remain, and the reservoir itself is still in part intact supported on a huge mass of masonry. Four holes are to be seen in that part of the front of the reservoir which is left, being the holes from which the lead pipes descended into the valley. It would appear from the remains of the reservoir that there must have been nine of these pipes in all. These holes are elliptical in shape, being 12 in. high by 9½ in. wide, and the interior of the reservoir is still seen to be covered with cement. The walls of the reservoir were about 2 ft. 7 in. thick, and were strengthened by ties of iron; it had an arched stone roof, in which there was an opening for access. From this the nine lead pipes descended the side of the valley supported on a construction of masonry, crossed the river by an aqueduct bridge, and ascended into another reservoir on the other side, as seen on the plan, entering this reservoir at its upper part just below the spring of the arches of the roof. From this reservoir the aqueduct passed to the next on the edge of the large and deep valley of Bonnan, being underground twice and having three bridges on its course, the last of which, the sixteenth on the course of the aqueduct, ends in a reservoir on the edge of the valley. Only one of the openings by which the syphons, of which there were probably ten, started from the reservoir is now left. The bridge across the valley below, and of which I have here a photograph and some engravings, had thirty arches, and was about 880 ft. long by 24 ft. wide.

A number of the arches still remain standing, and, as will be seen by the photograph, in some instances, the pillars of the arches were con-

structed of transverse arches themselves. The work consisted of concrete formed with Roman cement, so hard that it turns the points of pickaxes when employed against it, with layers of tiles at regular intervals. The surface of the concrete is covered with small cubical blocks of stone, placed so that their diagonals are horizontal and vertical, and forming what is known as *opus reticulatum*. After crossing the bridge the pipes were carried up the other side of the valley into a reservoir, of which little remains, and then the aqueduct was continued to the next valley, passing over three bridges in its course.

This valley, that of St. Irenée, is much smaller than either of the others, but, nevertheless, it was deep enough to necessitate the construction of inverted syphons, of which there were eight.

Leaving the reservoir on the other side of this valley, the aqueduct was carried on a long bridge,—the twentieth on its course,—which crossed the plateau on the top of Fourvières, and opened into a large reservoir, the remains of which are still to be seen on the top of that hill. From this reservoir, which was 77 ft. long and 51 ft. wide, pipes of lead conveyed the water to the Imperial Palace, and to the other buildings near the top of the hill. Some of these leaden pipes were found in a vineyard near the top of Fourvières at the beginning of the eighteenth century, and were described by Colonia in his "History of Lyons." They are made of thick sheet lead, rolled round so as to form a tube, with the edges of the sheet turned upwards, and applied to one another in such a way as to leave a small space, as shown in the diagram, which was probably filled with some kind of cement. These pipes, of which it is said that twenty or thirty, each from 15 ft. to 20 ft. long, were found, were marked with the initial letters, "TI. CL. CAES." (Tiberius Claudius Cæsar), and afford positive evidence that the work was carried out under the Emperor Claudius. Lead pipes, constructed in a similar manner, have also been found at Bath, in this country, in connexion with the Roman baths.

It will be seen at once that the great difference between this aqueduct and those near Rome arises from the fact that instead of being carried across a nearly flat country, it was carried across one intersected with deep ravines, and that it was therefore necessary to have recourse to the system of inverted syphons. There can be no doubt that the inverted syphons were made of lead, although no remains of them have been found, for we know that the Romans used lead largely, and, as we have seen, pieces of the leaden distribution pipes have been found. It is possible, and even likely, that strong cords of hemp were wound round the pipes forming the syphons, as is related by Delorme in describing a similar Roman aqueduct syphon near Constantinople. Delorme also describes, in the aqueduct last mentioned, a pipe for the escape of air from the lowest part of the syphon carried up against a tower which was higher than the aqueduct; and it is certain that there must have been some such contrivance on the syphons of the aqueduct at Lyons. Flachéron supposes that they consisted of small pipes carried from the lowest part of the syphons up along the side of the valley and above the reservoirs, or in some instances of taps fixed at the lowest part of the syphons.

The Romans have been blamed for not using inverted syphons in the aqueducts at Rome, and it has been said that this is a sufficient proof that they did not understand the simplest principles of hydraulics; but the remains of the aqueducts at Lyons, which I have been describing, negative this assumption altogether. The Romans were not so foolish as to construct underground syphons many miles long for the supply of Rome, but where it was necessary to construct them for the purpose of crossing deep valleys they did so. The same Emperor Claudius, who built the aqueduct at Rome known by his name, built the aqueduct of Mont Pila at Lyons, and it is quite clear, therefore, that his engineers were practically well acquainted with the principles of hydraulics.

It is thus seen that the ancient Romans spared no pains to obtain a supply of pure water for their cities, and I think it is high time that we followed their example and went to the trouble and expense of obtaining drinking-water from unimpeachable sources instead of, as is too often the case, taking water which we know perfectly well has been polluted and then attempting to purify it for domestic purposes.

Illustrations.

OFFICES OF THE COMMERCIAL UNION ASSURANCE COMPANY, DUBLIN.

WE give this week an illustration of this building, which has been erected at the corner of College-green and Grafton-street, Dublin, from the designs of Messrs. T. N. Deane & Son, at a cost of 5,644*l*. It was commenced in September, 1879, and completed in April, 1881. The material principally used externally was yellow Mansfield stone. The contractors were Messrs. Wardrop & Son, of Dublin.

As will be seen, the building forms one of the now more and more rare examples of modern Gothic applied to secular buildings, and in that respect is a good specimen of its class, solid and unpretentious in style and detail.

ALTO-RELIEF PANEL BY MR. TINWORTH.

THIS panel, which is entitled "Waiting for the Head of John the Baptist," forms one of the examples of Mr. Tinworth's art now being exhibited at Messrs. Doulton's. As in most of Mr. Tinworth's treatments of Scriptural subjects, there is a strong realism and dramatic contrast in the figures. The grief of Herod is contrasted with the callous and critical humour of the daughter of Herodias; the remainder of the company make their various comments, the nature of which may be gathered from their varied expressions; the monkey takes advantage of the pre-occupation of the whole party to make free with the contents of the vase standing by the table.

GOWER'S WALK FREE SCHOOLS, RUPERT STREET, WHITECHAPEL.

THESE schools were founded by Mr. W. Davis, of Leytonstone, whose connexion with Whitechapel through the sugar-refinery he had in the neighbourhood brought before him the immense difficulties which existed at that date (1808), before a sound useful education was possible to the very poor people living in that district.

Himself an ardent churchman, he exacted two conditions before receiving children into his school: the one was the poverty of the parents; the other, willingness to attend the Sunday services of the Parish Church of St. Mary, Whitechapel.

In those days when there was little or no education for the poorer classes, this, freely offered, was an incalculable boon, greatly appreciated, and greatly repaid to the founder in the success of many of the scholars.

From 1808 to 1854 (the year of his death) these schools were under Mr. Davis's personal supervision; he attached to them a printing-press, which served the double purpose of greatly lightening the expense, and of training such boys who cared to learn, to follow the business of printing.

The girls were brought up to the use of the needle, and employed in making clothes for themselves and the boys, which were given gratuitously to those whose conduct was exceptionally good.

Seven trustees were appointed, and the school has always remained in the hands of Mr. Davis's immediate family; the Rector of Whitechapel, in virtue of his office, being the only trustee appointed unconnected with the founder.

The recent purchase of the original schools and site by the London, Tilbury, and Southend Railway Company, has made it compulsory on the trustees to buy other ground; but the original intentions of the founder have been adhered to, and the school has been re-erected in the same parish.

The arrangement on plan is as follows:—on the right of the main entrance, and facing Lambeth-street, is the residence of the superintendent and schoolmistress, connected on the ground-floor with the printing house. On the left, and extended backwards to Rupert-street, are the schools, to hold 184 children, with cloak-rooms, &c. The entrances for the two sexes being kept separate and accessible from their respective covered playgrounds, which extend under both school and class-rooms, the playground level being some 6 ft. below Rupert-street, the boys' entrance being from that side; the girls' entrance from Lambeth-street. The space below printing-house is devoted in part to a dining-room for the children. The whole is faced with stock, with red brick dressings. Messrs. Kirk & Randall, of Woolwich, are the contractors. The carving has been executed by Messrs. Earp, of Lambeth. Mr. Ernest C. Lee is the architect.

KUDAT CHURCH.

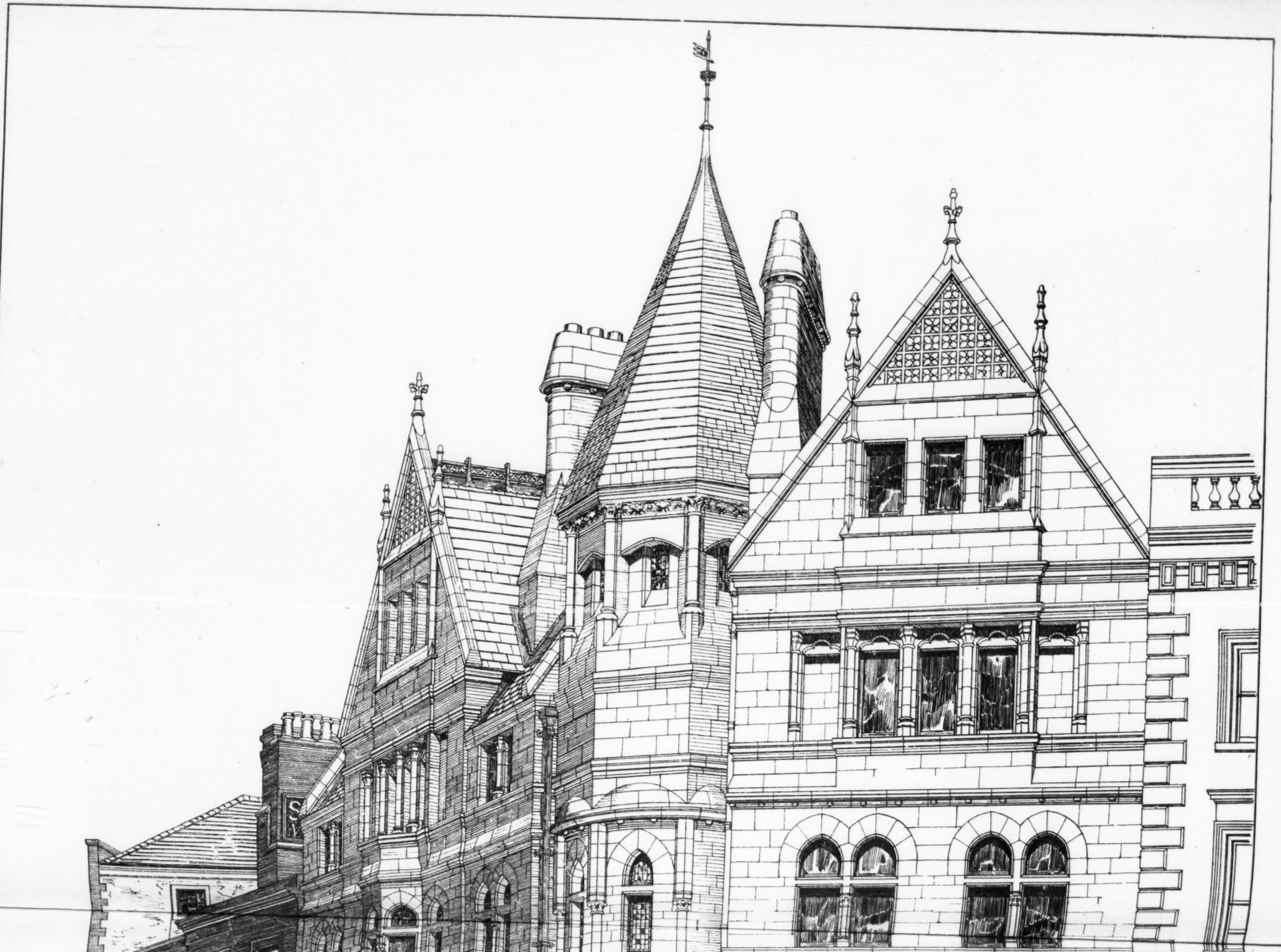
THIS was designed for the British North Borneo Company's settlement at Kudat. The construction had to be simple, and the materials also such as could be easily obtained on the spot. The walls up to the top of the plinth are of brickwork faced with cement, as also are the angle buttresses, and the lower portion of the tower; with these exceptions, the superstructure is formed entirely of "Bilian," a very hard and durable wood, well suited for the framing of the walls and roof, and for filling up and covering the same. The entire area of the floor is filled up solid and paved, so as to allow no harbour for reptiles. The architect is Mr. W. Kidner.

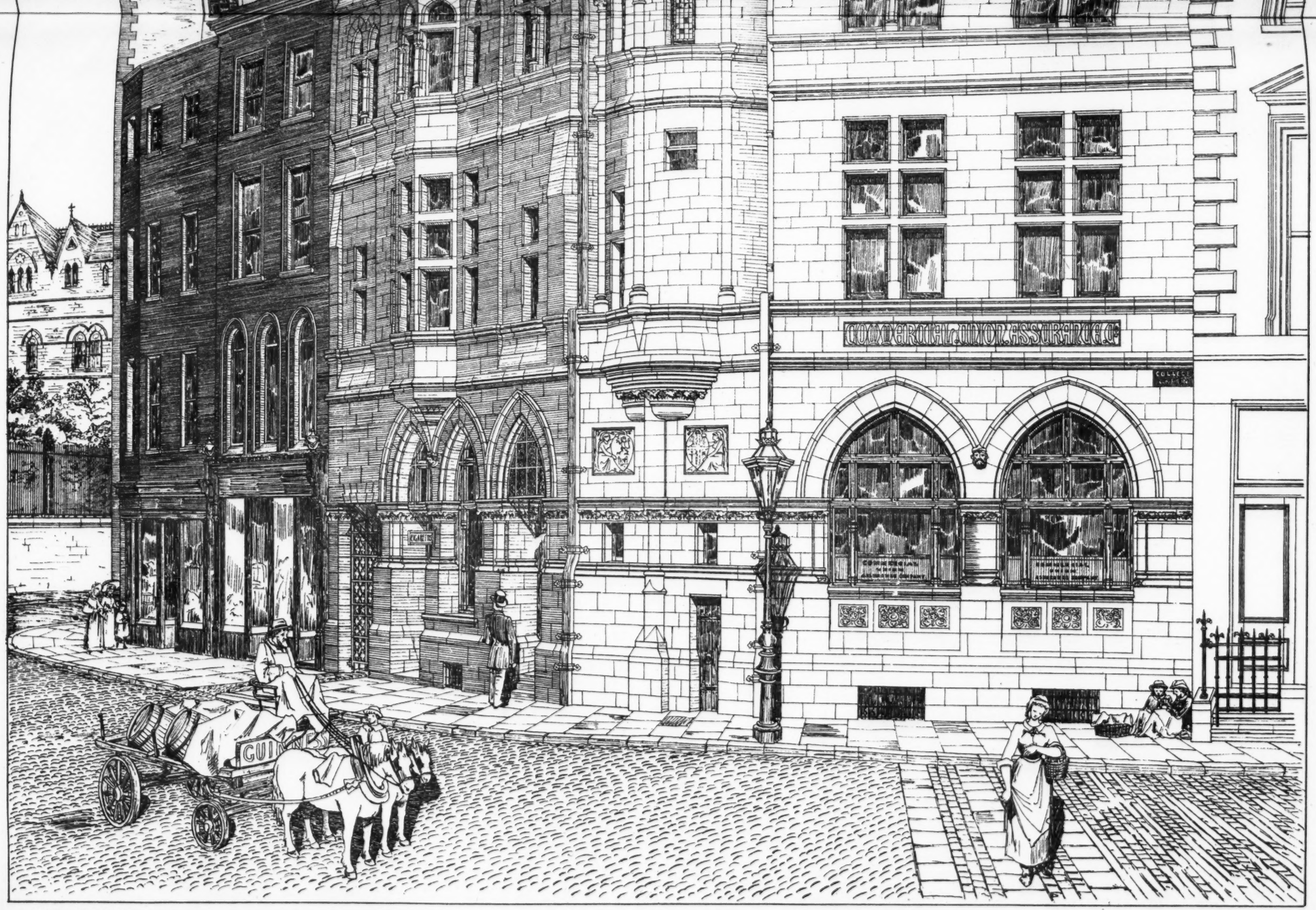
SECTION AND PLANS OF SIR C. BARRY'S COMPLETION OF WESTMINSTER PALACE.

WE give this week a section through Westminster Hall and the new wing which Sir Charles Barry proposed, in order to complete the quadrangle west of Westminster Hall, and also plans of his two schemes marked A and B. Scheme A, as shown in the lithographed section and in the engraved plan on a separate page, provides only one range of rooms in the new wing, with a corridor towards the Westminster Hall Court; scheme B provides a double range of rooms, but at the cost of somewhat unduly narrowing the courtyard. The modification made by Mr. C. Barry consists mainly, as far as the plan is concerned, in turning the line of it a little inward or eastward at the southern end, so as to allow more room for the roadway between the new building and St. Margaret's Church.

In reference to statements which have been circulated to the prejudice of the completion of Sir C. Barry's design, it will be observed that these plans show (1) that the new wing would not interfere with the light to Westminster Hall (which, besides, is more lighted by the end windows than by the side ones); (2) that it does not, as a matter of fact, necessitate the removal of any of the Westminster Hall buttresses, though it is probable that Sir C. Barry would have troubled himself very little about that one way or another; (3) that it does not necessitate the removal of St. Margaret's Church; and (4) that so far from narrowing the roadway adjoining St. Margaret's Church, the roadway shown on these plans is wider than there has ever been there yet. At the southern extremity of the new wing, on the lithographed plan, is shown by a dotted line the present footpath curb line, giving a width to the roadway of 37 ft. 3 in. at its narrowest part; while the completed building will leave the roadway 58 ft. wide at its narrowest part. "We hope here be truths."

Australia and the British Unemployed. There can be no greater mistake than that of shipping large numbers of people to New South Wales and other Australian Colonies, simply because they cannot find employment here. It is like jumping out of the frying-pan into the fire. It is not increased town population, but increased country population which is required; and of the thousands who are hopelessly seeking work in our great industrial centres, how many are familiar with the routine of agricultural or pastoral life? New South Wales is not yet a great manufacturing country; most of its leading industrial establishments are on a modest scale compared with those of the United Kingdom; consequently those accustomed to labour in the workshop or factory should obtain assurance of employment before taking a passage to Sydney. Handy men, who can do work on their own account, such as tinsmiths, blacksmiths, carpenters, brickmakers, masons, and so on, who are willing to settle in the younger townships of the colony, can always do well, although at first they may have to "rough it" until the necessary experience has been acquired.—*Australian information for British Emigrants.*





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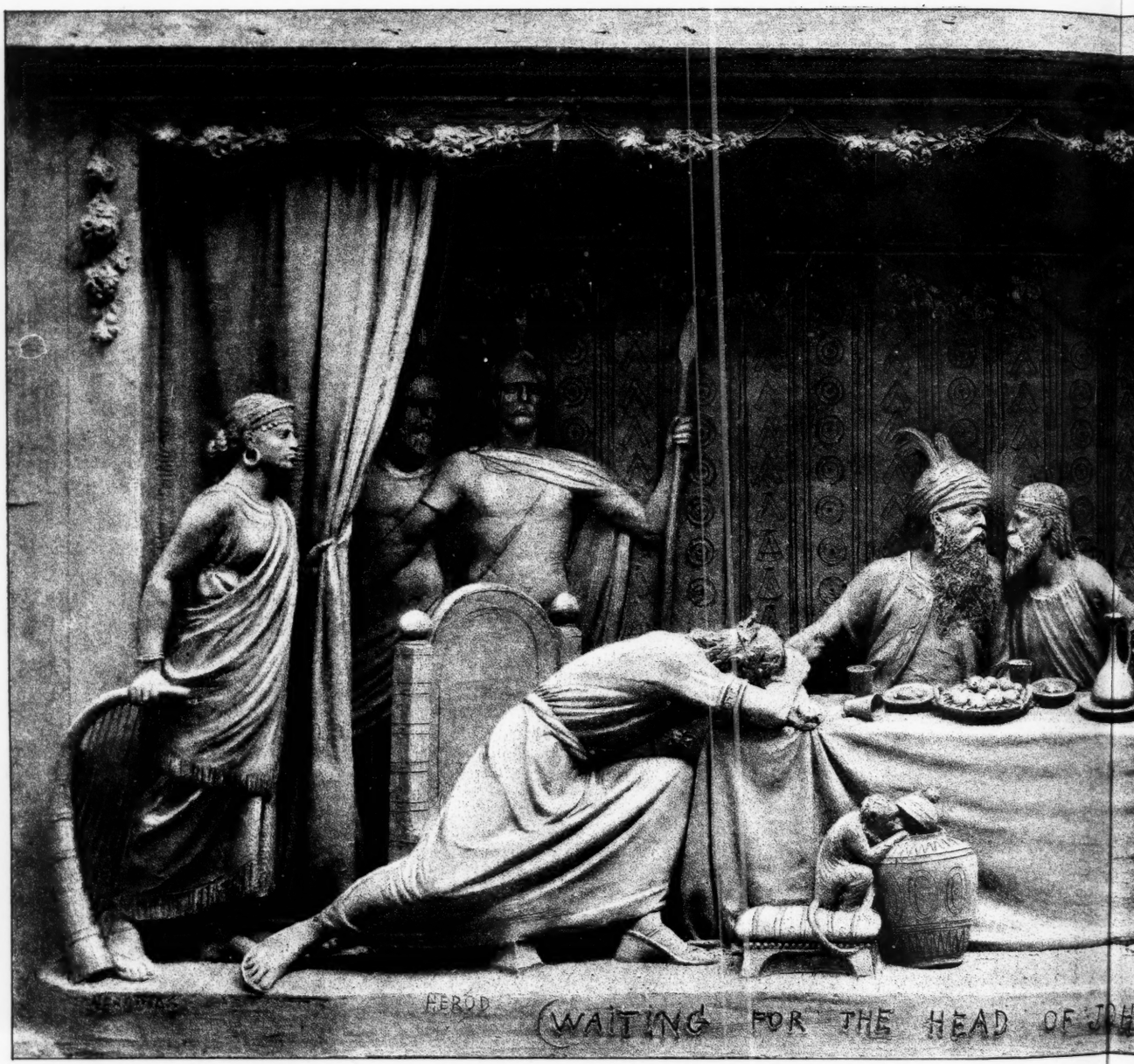
8. Castle St Holborn. London. E.C.

BUILDINGS FOR THE COMMERCIAL UNION ASSURANCE COMPANY, COLLEGE GREEN, DUBLIN.

MESSRS. T. N. DEANE & SONS, ARCHITECTS.



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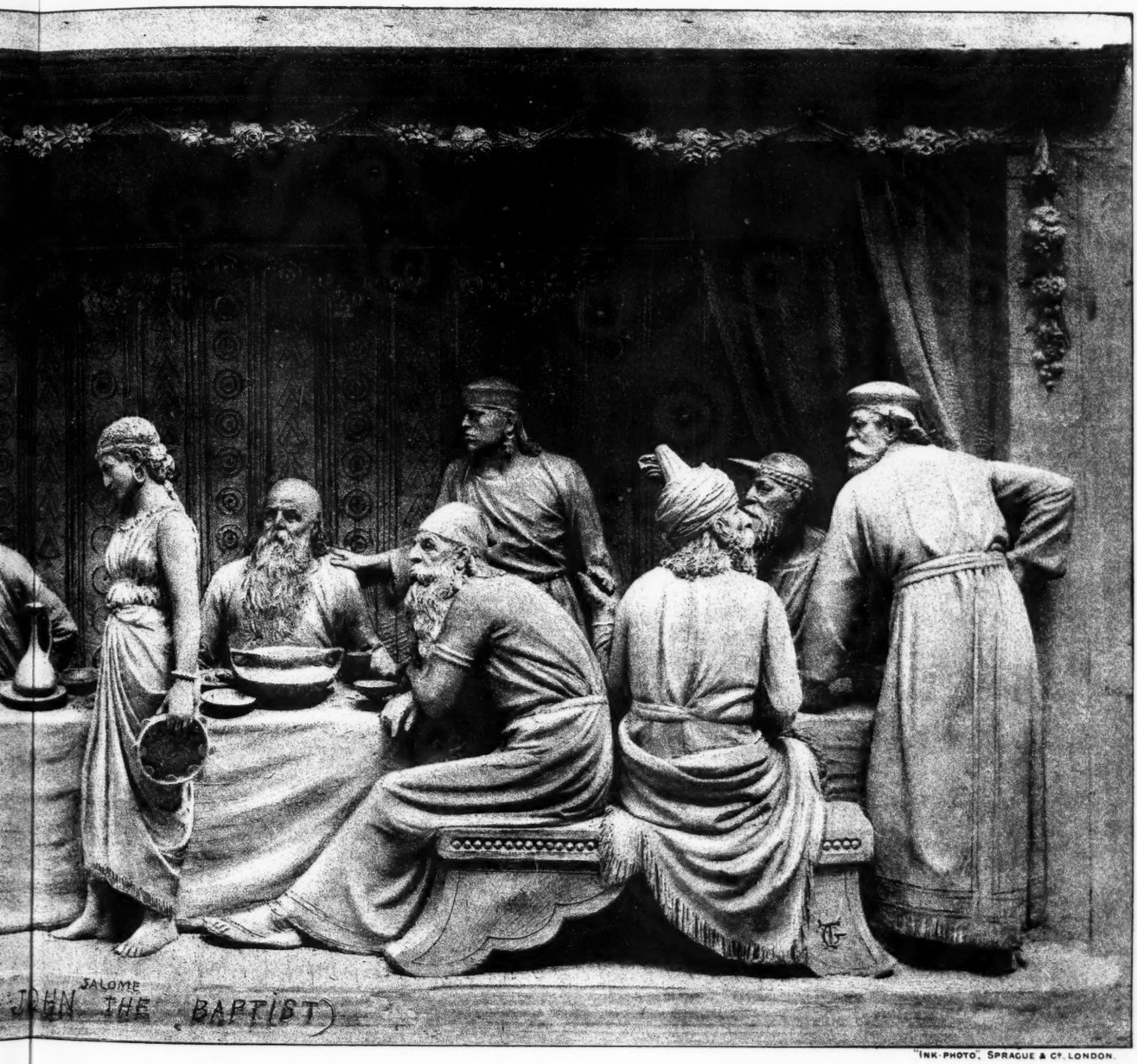

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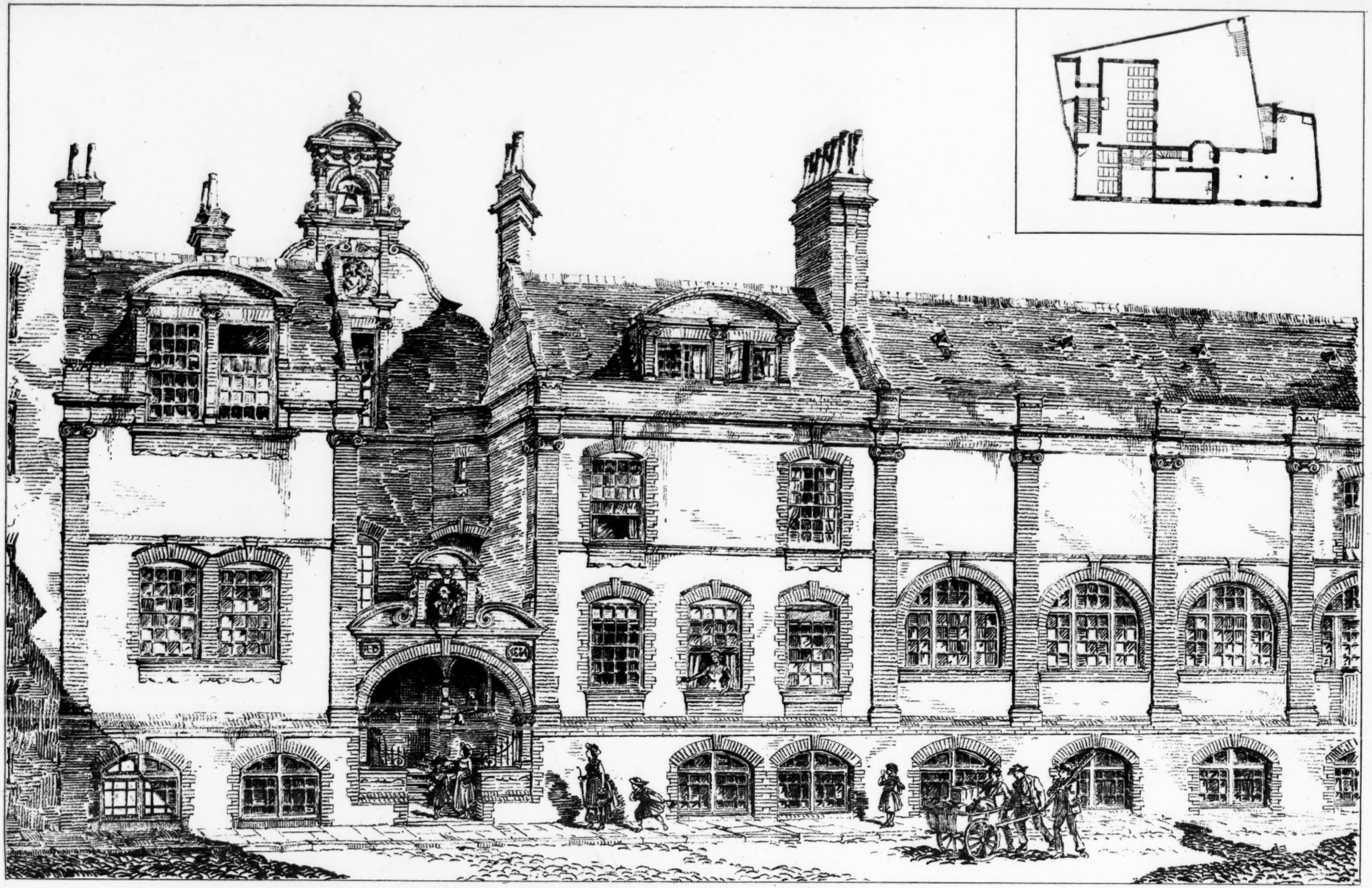
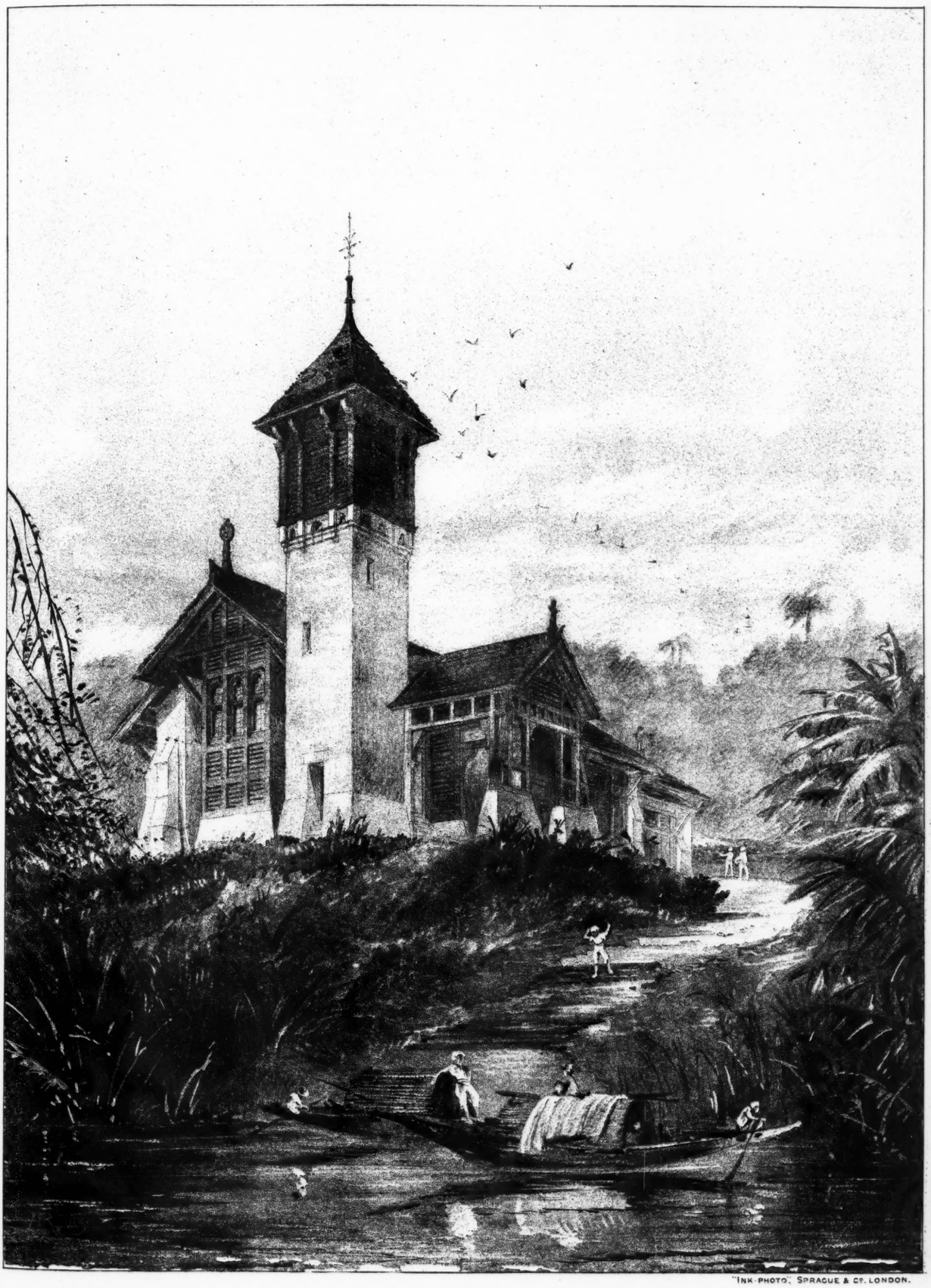
EF IN TERRA-COTTA,

TINWORTH, SCULPTOR.



GOWER'S WALK FREE SCHOOLS, RUPERT STREET, WHITECHAPEL.

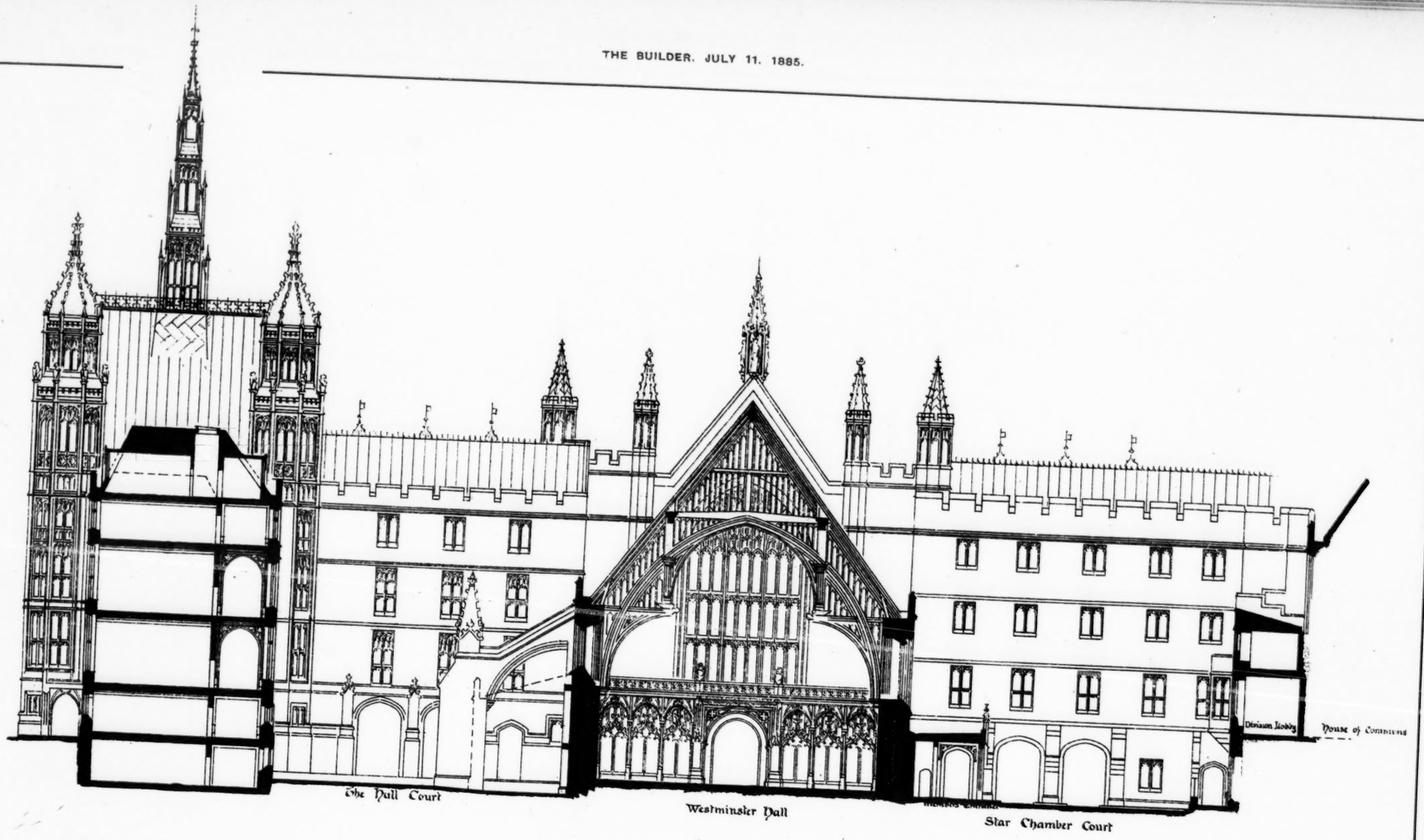
MR. EVEREST C. LEE, F.R.I.B.A., ARCHITECT.



"INK-PHOTO," SPRAGUE & Co. LONDON.

CHURCH FOR THE BRITISH NORTH BORNEO COMPANY'S SETTLEMENT, KUDAT.

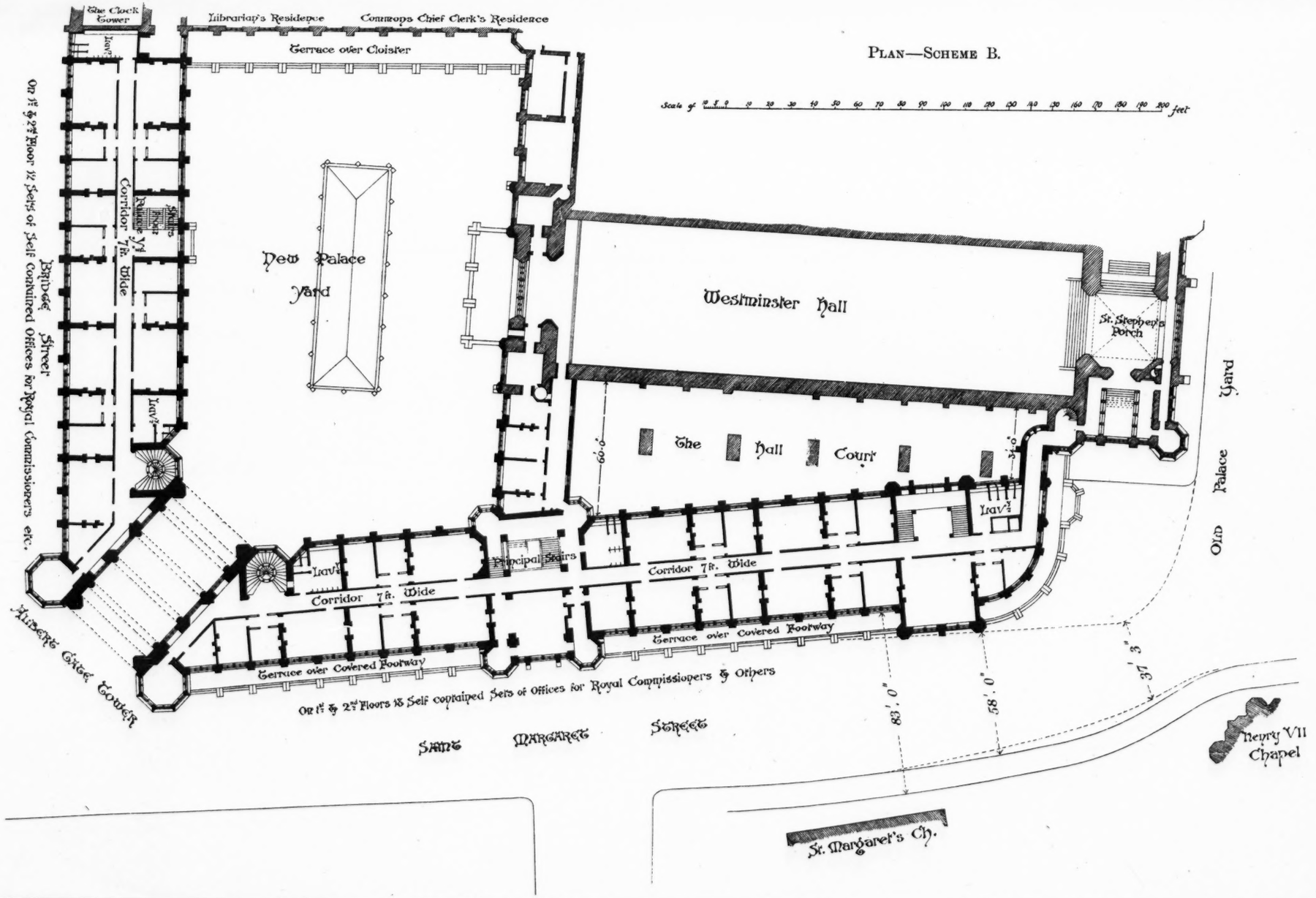
MR. W. KIDNER, F.R.I.B.A., ARCHITECT.



SECTION LOOKING NORTH—SCHEME A.

scale of 10 0 10 20 30 40 50 60 70 80 90 100 110 120 *feet*

(For plan of this Scheme see separate engraving).

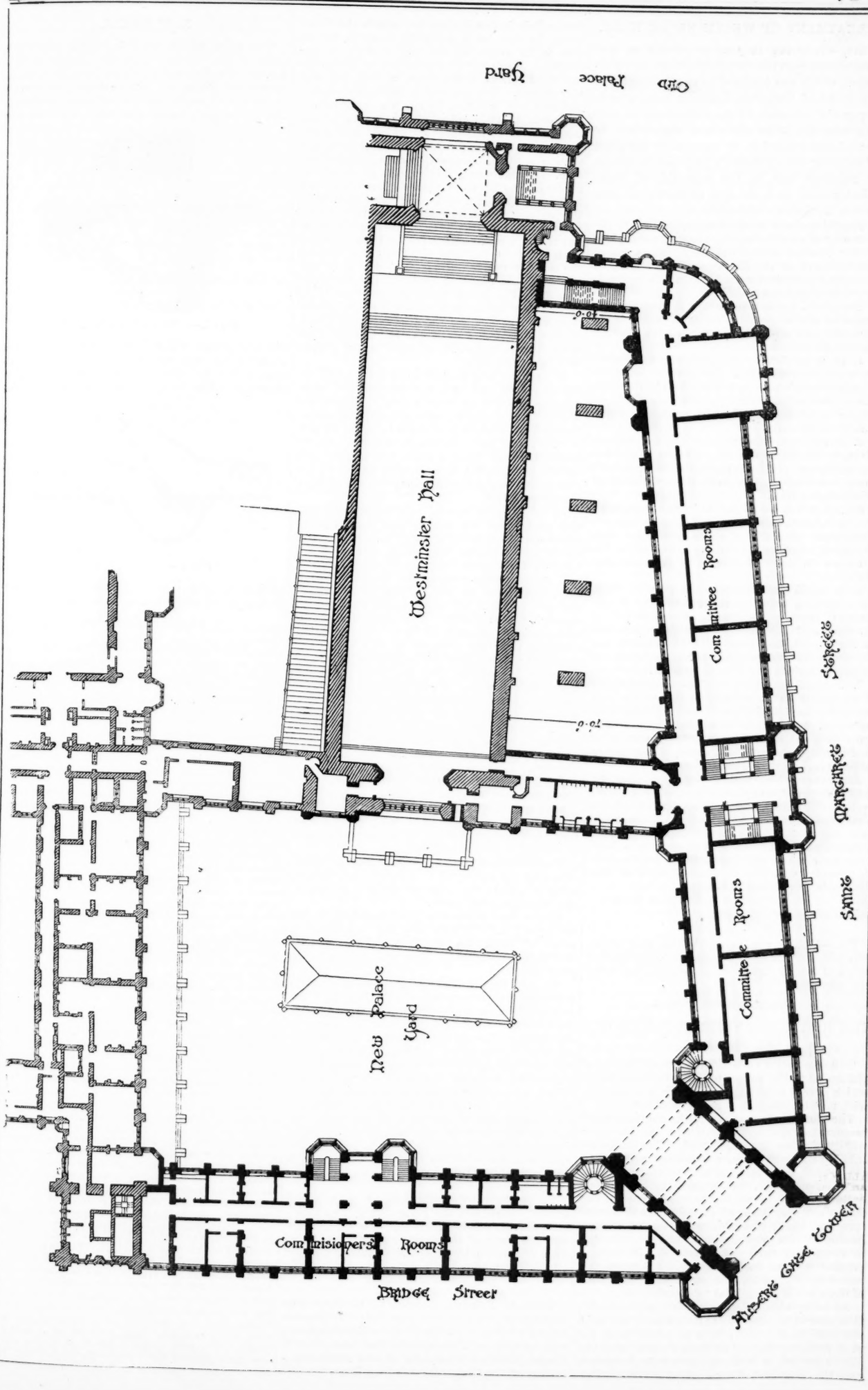

PLAN—SCHEME B.
Scale of 10 5 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 feet
The Clock Tower
Librarian's Residence
Commons Chief Clerk's Residence
Terrace over Cloister
New Palace Yard
Westminster Hall
St. Stephen's Porch
Old Palace Yard
Corridor 7ft. Wide
Bridge Street
Or 1st & 2nd Floor 12 Sets of Self Contained Offices for Royal Commissioners etc.
The Hall Court
60·0
31·0
Principal Stairs
Corridor 7ft. Wide
Terrace over Covered Footway
Or 1st & 2nd Floors 18 Self contained Sets of Offices for Royal Commissioners & Others
Victoria Tower
SAINT MARGARET STREET
83'.0"
58'.0"
37'.3"
Henry VII Chapel
St. Margaret's Ch.

C. F. Kell Photo-Lith. & Printer.

8. Castle St. Holborn. London. E.C.

THE TREATMENT OF WESTMINSTER HALL.

SIR C. BARRY'S PLANS FOR THE COMPLETION OF WESTMINSTER PALACE, AS MODIFIED BY MR. C. BARRY.



SIR C. BARRY'S PLANS FOR THE COMPLETION OF WESTMINSTER PALACE, AS MODIFIED BY MR. C. BARRY. PLAN OF SCHEME A. *(For Section, see Lithographed Plate.)*

TREATMENT OF WESTMINSTER HALL.

SIR,—Referring to your comments on and conclusions from the detailed evidence now published, which was tendered to the Committee of the House of Commons, I cannot help remarking on the omission by the Committee to publish with the other plans and documents *the special plan* handed in by me to show the effect of carrying out my father's proposals in respect of buildings both on the west side of Westminster Hall and for the enclosure of New Palace Yard also with buildings.

The Committee in their Report allude to the necessity of considering the proposals and plans of Sir Charles Barry, but they do not afford the Members of the House any opportunity of forming a judgment upon them, which seems to me to be somewhat unfair.

The plan I handed in to the Committee was prepared at the special request of some of its members, and it was really necessary to be given for several reasons.

1. It is needed to illustrate the evidence I gave and the estimate I also gave dividing Sir Charles Barry's proposal into two distinct portions. See p. 165 of the "Report and Evidence" (paper handed in by the Chairman, but which was given by me).

2. It will make the evidence and suggestions given by the Right Hon. Mr. Ayrton (late First Commissioner of Works) intelligible, and, as I think, convincing as regards the treatment of Westminster Hall.

3. It will dispose of the objection suggested by the Chairman that if Sir Charles Barry's plan were carried out there would be very damaging interference with light and air to the windows in the west side of Westminster Hall.

4. It would also show that not only is there no connexion between the realisation of Sir Charles Barry's plan and the removal of St. Margaret's Church, as is unfairly inferred in the report, but that while the church can remain as it is, the roadway accommodation can be made much better than at present.

5. It would have been only fair to the memory of my father to have kept on record his proposals for the completion of his great building (accepted by the nation, as Mr. Ayrton very properly says), even if those proposals are to be held in abeyance, and, still more, if they are to be permanently disregarded.

All these obvious reasons for appending my plan may perhaps explain why it was not given, as the Committee, at the instigation of its Chairman, seems to have been determined to give consideration to my father's proposals nominally only and not seriously, since a foregone conclusion had somehow to be reached, if possible, viz., the recommendation of Mr. Pearson's proposals and design.

CHARLES BARRY.

1, *Westminster-chambers*,
July 6th, 1885.

P.S.—I send you herewith the plan which was prepared for the Committee (above alluded to), and which has been returned to me without comment.

THE HISTORY OF THE FUNGUS KNOWN AS DRY ROT.

THE dissolution of wood by dry-rot has been attributed to the action of *Merulius lacrymans*, which is very common in Germany in connexion with new buildings, but rarely with old.

The *Merulius lacrymans* is the common wood fungus that destroys nine-tenths of the wood with which we are acquainted. The reason of it being common to new buildings, and not to old, is that moisture, one of the constituents of its existence, is more present in new green buildings than in old dry seasoned ones. The two prime conditions of its existence are moisture and heat; if moisture is present without heat it will not grow, and hence its depredations in the winter time are unknown. If heat is present without moisture it will not grow, and hence ventilation for the passage of a current of dry air will prove fatal to its existence.

As to its original habitat, it is world-wide, for it is associated with our native woods, and with our introduced woods; it is as common to the pine and fir reaching us from Canada and the White Sea as it is in the pine from Savannah and the Southern States of America. Professor Poleck says it does not attack the living tree. In this he is certainly in error, for we owe to its action all the hollow trees in our forests. Mature trees are subject to the breaking up of nature in the form of ring, cup, and star shakes. The tap root is destined to decay, and its place is taken by the fox or the coney, lodgment is thus afforded for germs of the *merulius*, the filaments of which ascend the fissures of the ring, cup, and star shakes, and silently work the destruction of the heart of the tree. We have seen this fungus so developed in the shakes of trees that we could remove it like a thick layer of felt. We have seen it on the highest and driest land in England, where it has ramified through the heart-wood of a large oak tree. We saw such a tree last year that had been felled and cut into planking. On opening the wood it was found so affected that it was laid aside, one plank on another, without strips or laths. The fungus went on growing, filling up the saw quits, and cementing the planks together, and holding them as fast as if glued, so fast that the tree might never have been sawn, for the tree could be rolled on the ground as if in a solid state.

In England this growth is common to all our native woods, and oak, our hardest and most durable wood, is so much a prey to it that our scientists for centuries have given special attention to it with the view of preventing its inroads in our naval and mercantile marine. To its action our old wooden walls fell a sure and certain prey, and it is not going too far to say that it was the greatest enemy our old wooden vessels ever had.

As to its more special association with deal and pine, that we admit, and here we are introduced to a great mystery in nature. The Baltic and Canadian firs, spruce, and pines are felled in their native forests in the winter season, and sledged to the river banks. They are floated down the rivers on the melting of the snow, and are not taken out of the water until passed through the saw-mills. The deals are cut in summer and stacked to dry. Upon being seasoned they are shipped to this and other countries; but if they are subject to heat and moisture in passage they are alive with the *merulius* or dry-rot. Upon arrival these germs can only attach themselves to the wood at the saw-mills, where the air must be laden therewith. Be this as it may, we have seen whole ship-loads alive with this fungus when the wood has been rained on during shipment, and the vessel has been long on passage.

Again, with goods that have reached our English yards in good condition, if piled too closely and they absorb the rain, the *merulius* makes its appearance in a very pronounced form, to counteract which in the early summer it is usual to re-pile and sweep the goods.

The Canadian pine is so susceptible of dissolution by the agency of this fungus that no two sides of planks can ever be allowed to touch, and must be piled apart.

If the wood remains in good condition in the store-yard until it gets into the constructive parts of buildings, the germ of this fungus will develope itself if heat and moisture are present.

We can hardly agree with those who would attribute the propagation of this fungus to the felling of timber in the spring and early summer, for the custom does not obtain in the forests of the North of Europe or in America. The wood is there all winter felled, and floated in the spring, the only time in the year when the rivers are in flood. In England the wood is all winter felled, with the exception of the oak, which is felled in the spring for the sake of the bark, only removable at this time of the year. So far as the wood is concerned, the practice cannot be defended. The effect is seen in the rapid dissolution of the sap; but whether it is detrimental to the heartwood is an open question.

To preserve by distillations of tar is sound advice,—these oils are poisonous to vegetation in any form, and hence its virtue when injected into the pores of the wood to protect the tissue from dissolution by vegetable or animal agency.

City of London School of Music.—The foundation-stone of the new City of London School of Music, on the Victoria Embankment, will be laid on Tuesday, the 21st inst., by Mr. Pearse Morrison, chairman of the Music Committee of the Corporation.—*City Press.*

NEW TRAPS.

THE traps which are being made under the name of the "Cerus" trap (H. Conolly & Co., Agents), two forms of which are here illustrated, though exhibiting no new principle, appear to be very well contrived for efficient working. The grease gully has a removable container for

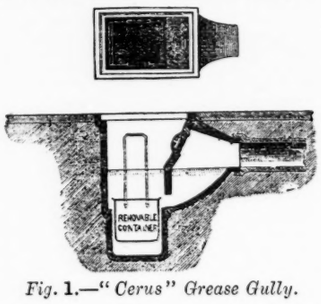


Fig. 1.—"*Cerus*" *Grease Gully.*

dirt and grease, which is more convenient than cleaning out the cavity itself; and, like the trap, it has an air-tight cover removable for cleaning. The trap, fig. 2, aims at a rapid

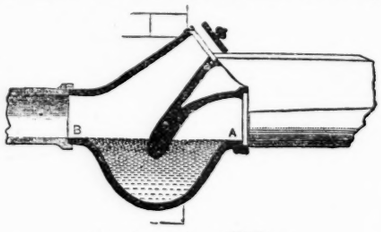


Fig. 2.—"*Cerus*" *Trap.*

wash-down and wash-up; the shape of the section seems adapted to secure this.

LIABILITIES OF OWNERS OF INSANITARY HOUSES.

SAUNDERS *v.* PAWLEY.

THIS was an action (heard in the Queen's Bench Division on the 1st inst. before Mr. Justice Day and a special jury) brought to recover damages for an alleged fraudulent misrepresentation as to the sanitary condition of a house at Croydon.

In March of last year the plaintiff (we quote from the *Times* report, correcting the name of the plaintiff, however) was in negotiation with the defendant with a view of becoming tenant of a house in the Auckland-road, Croydon, named Abbottswood. The case for the plaintiff was that on the 19th of that month the defendant stated to the plaintiff that the house was in a perfect sanitary condition, and that the sanitary arrangements of the house had been carried out under the supervision of the Croydon local authority; that by reason of this statement the plaintiff was induced to agree to take the house for three years at a rent of 80*l.* a year; and that this statement was false, and was made fraudulently. On the 20th of March the plaintiff agreed to take the house. The plaintiff, with his family, went into the house at the end of March, but the house not being completed, he went to the seaside, and on the 18th of May he returned to the house. Shortly after his return his cook, and afterwards his gardener, were taken ill, and subsequently the plaintiff's stepson was seized with illness, and on the 1st of June the plaintiff's wife was seized with purging and vomiting, which resulted in blood-poisoning, from which she died in about a fortnight after her first seizure. Upon examination it appeared that the stopping of the joints of the soil-pipe, which was outside the house, 2 ft. 10 in. from the front door, was so faulty that sewer gas could escape through them, and that a P-trap, to which it had been intended to connect a rain-water pipe where a conservatory should have been built, had been left without water and broken, so that sewer gas could escape. This trap was near the library window, in which room Mrs. Saunders often sat in the morning. It was also found that a drain at the back of the house had in it some broken bricks which had stopped it up. After Mrs. Saunders's death the plaintiff removed from the house. He estimated the actual expenses to which he had been put at 228*l.* 10*s.* He further claimed damages for the loss of his wife. It appeared that she was possessed of an income of about 1,000*l.* a year. She had, however, only a life interest in it. Upon receipt of her income her habit had been to pay it to her husband, who expended it in maintaining the joint establishment. At the time of her death, Mrs. Saunders was sixty years of age, and until her illness had been very healthy. The defendant, who is an architect practising in the City, was the builder of the house. He stated that the representation which he made to the plaintiff was

that the sanitary arrangements of the house had been carried out under the supervision of the Croydon Local Authority, and this was the case.

The officials of the Authority were called, and stated that they had inspected the drainage arrangements of the house upon its completion, and had not raised any objection to any of them, which they would have done if they had not been in a satisfactory condition. It was suggested on behalf of the defendant that when the plaintiff's furniture was being taken into the house, the soil-pipe must have received a blow which had loosened the joint.

In answer to questions put to them by his Lordship, the jury found that the defendant did make the representation alleged as to the condition of the house; that it was false and fraudulent; that the plaintiff was induced by it to take the house; and that it was on account of defects in the drainage arrangements that Mrs. Saunders died. They assessed the damages sustained by the plaintiff from the loss of his wife at 2,000*l.*, and his expenses at the amount claimed.

Judgment was accordingly entered for the plaintiff for 2,228*l.* 10s.

His Lordship also directed that the agreement should be rescinded.

DRY-ROT IN FLOORS.

SIR,—I should be glad of some information as to how to check the spread of dry-rot in a floor. The floor in question is composed of 7 in. by 2½ in. battens, laid flatways on bond timber on sleeper walls; depth from floor to ground about 8 ft. Although there is plenty of ventilation, rot has eaten into the battens about half way through. Can this be effectually stopped by applying any solution or coat of tar, and in doing so would it prevent the rot making any further progress after the application? Any suggestion will be gladly received.

INQUIRER.

A QUESTION OF BUILDING LAW.

SIR,—Will you kindly say what is the right interpretation of the following case, which is ruled by the Public Health Act (38 & 39 Vict., c. 55, part 2, clause 156):—

"It shall not be lawful in any urban district, without the written consent of the urban authority, to bring forward any house or building forming part of any street, or any part thereof beyond the front wall of the house or building on either side thereof, nor to build any addition thereto beyond the front of the house or building on either side of the same."

This clause is incorporated in the By-laws or Building Regulations of our Corporation, with the following alteration only, viz., "Local Board" in place of "Urban Authority."

The following illustration will show the ruling of our Corporation as to the meaning of the clause.

An estate is laid out into building land, streets are formed (not less than 16 yards wide) with no building lines shown or stipulated. A portion is sold, and the purchaser, for his own convenience, sets back the front of the building some distance from the street line; our Corporation then says that any one else building (on either side thereof) upon land abutting upon this street must set their buildings back to the same frontage-line as the first one to build.

If this is the correct meaning of the clause, it is a very serious question for all owners and purchasers of land, &c.

If this is not the correct meaning, would you, or some of your correspondents, give me a case that has been tried on the subject?

By answering this, you will confer a favour upon all architects practising in this town.

WILLIAM LONGLEY,
July 6, 1885. Architect, Bradford.

*** The passage referred to is, in fact, a by-law made under the authority of sec. H., 157, and as such, if read grammatically and by itself, it seems to bear the interpretation put on it by the Bradford Local Board. It may be a question, however, whether in the Act itself a few isolated houses could properly and strictly be termed a "street." The case stated by our correspondent is one which certainly shows an unnecessary hardship to be placed on some house-owners. At the same time, there may be other facts not brought to our knowledge which would be of importance in forming a final judgment on the matter.

School of Art Wood-Carving.—We are asked to mention that the School of Art Wood-carving in the Royal Albert Hall will be closed on the 11th inst. and re-opened in the City and Guilds of London Technical Institute, in Exhibition-road, on the 13th inst. While continuing their handsome contribution towards the funds of the school, the Council of the Institute have now provided it with rooms in their new building rent free, and have gone to some expense in making arrangements for the accommodation of the class for women.

PROVINCIAL NEWS.

Nottingham.—The Park-row reservoir of the Nottingham Corporation Waterworks Department has just been re-opened for use after a very considerable extension and thorough reconstruction. Its internal dimensions are now as follow:—179 ft. 3 in. long, 140 ft. wide, and 14 ft. deep from floor to springing of the roof arches. It is estimated to contain about two and a quarter millions of gallons of water. The side walls are 4 ft. 6 in. thick at the base, and are built of hand-made bricks from the Mapperley yards of the Nottingham Patent Brick Company, on a concrete foundation, and strengthened on the outside by abutment walls of Portland cement concrete. The top or roof is formed of a series of arches built of brick, set in mortar composed of Portland cement and thoroughly-washed river sand, carried on strong wrought-iron girders, which are supported by 111 cast-iron columns, 10 in. diameter. These are bedded on hard Yorkshire stone bases and brickwork. The floor is formed with clay-puddle 15 in. deep, on which is a bed of Portland cement concrete, 9 in. thick, and finished off with Portland cement, trowelled to form a very smooth surface. The side walls also are covered in a similar manner. The whole of the top of the roof exposed to view on the outside is covered with Portland cement concrete and a double thickness of Val de Travers asphalte, and is laid with a fall from the centre towards the four sides so as to carry off the rain water quickly, which is then conveyed away by channels constructed for the purpose. Along Park-row and the Rope-walk is a boundary-wall, faced with red pressed bricks, surmounted by a bold moulded stone coping, and an iron railing. The whole of the work has been very efficiently carried out by Mr. Thomas Smart, contractor, Trent Bridge, Nottingham, in the comparatively short time of twenty weeks, from drawings supplied by, and under the superintendence of, the Engineer to the Water Department, Mr. M. O. Tarbotton and his assistant, Mr. Wharton, the clerk of works being Mr. Phillips. Messrs. Goddard & Massey supplied the iron columns and girders used for supporting the roof, and Mr. Hughes provided the iron railing for boundary-wall. This is stated to be the third reservoir Mr. Smart has constructed for the Nottingham Corporation. In the course of the proceedings at the meeting held in the reservoir to celebrate its completion, the Engineer, Mr. Tarbotton, stated that Nottingham was the first town in England which had adopted the system of high-pressure water-supply, and it had continued without any cause of complaint for forty years. He spoke highly of the way in which Mr. Smart had executed the contract.

Beverley.—The annual general meeting of proprietors of land within the Beverley and Barmston drainage district was held at Beverley on the 25th ult., Mr. W. Bainton, of Beverley Parks, in the chair. Mr. Tiffen, the engineer, read an account of the works, now nearly completed, which have been carried on to improve the drainage, the contract having been entered into in October, 1882, since which time 155,000 cubic yards of mud and clay have been dredged from the bed of the river and deposited on the banks. The dredging has extended over a length of twenty miles, and seventeen miles of banks have been raised and strengthened. The work has been done under plans prepared by Mr. J. Wolfe Barry, M.Inst.C.E., by Mr. Chas. Simons, of Grimsby; Mr. Tiffen, the engineer, and Mr. Evans, his surveyor, having superintended it.

Sheffield.—Prince Albert Victor of Wales on the 1st inst. opened the Industrial Exhibition which the Cutlers' Company have organised. The primary objects of the exhibition are the cultivation of superior workmanship in the immediate district, and the assertion of Sheffield's continued pre-eminence in the cutlery department of the metal trade, notwithstanding increased competition. It practically covers all trades carried on within the district of Hallamshire, and the exhibits are confined to articles which have been manufactured by the exhibitor's own hands. The handicraft exhibits show all stages of manufacture in a wide variety of different articles from each district. For instance, files are shown first as forgings or mere shapes; then after grinding, which brings the surface even for the cutter to work upon; and lastly, in a finished condition. Other processes are illustrated in a similar manner. There are altogether eight different sections in the Exhibition, the first of which embraces the steel, file, saw, and edge-tool trades generally; the second the electro-plate and Britannia metal trades; the third, cutlery in general; the fourth, engineers' and machine tools; the fifth, fender, fire-iron, stove, grate, and general ironfounding trades; and the sixth, special prizes for any specimens of handicraft not included in the schedule. The gross value of the prizes offered is 750*l.*, divided into 330 prizes.

Didlington.—Didlington Hall has, during the last two years, undergone considerable alterations and additions, conspicuous amongst the new works being a large museum or gallery, for the purpose of holding Mr. Amherst's collection of antiquities and curiosities. A few days ago a substantial dinner was given, to celebrate the roof raising, to the workmen employed on the works. About 160 sat down to a bountiful repast in the new room, suitably fitted up with a temporary floor and tables, and presided over by the worthy squire, the architect, Mr. Norman Shaw, being seated on his right, and the contractor, Mr. William Hubbard, on his left. Mr. Hubbard, in proposing the health of Mr. Amherst, stated that some few years ago, when work was very scarce, and a great number of men in the neighbouring villages had nothing to do, Mr. Amherst laid out a scheme for excavating a large area of ground, and forming a lake, in which is laid out geographically and to scale, the island of Cyprus and surrounding islands, and again, last year, he had about 30 acres of ground trenched and planted by manual labour during the winter and spring. These and many other acts of kindness, both in cases of sickness and distress, showed how desirous Mr. Amherst was of securing the health and comfort of his poorer neighbours. The chairman responded, and explained that for several years he had contemplated making alterations and additions to the hall, but had experienced great difficulty in arranging a plan. After consulting several architects it was his good fortune to meet with Mr. Norman Shaw, an architect of the highest eminence, who had been able to meet the requirements of the house. He was, therefore, most happy to propose the health of Mr. Norman Shaw, who had so ably planned these alterations and additions. Mr. Shaw, in acknowledging the compliment paid him, thanked Mr. Amherst and all present, and stated that he was entirely satisfied with the manner in which his instructions and plans had been carried out. He should, therefore, without further delay, propose the "Health of the contractor, Mr. Wm. Hubbard," but must add how rare it was at the present day to find a builder with such determination to act honestly, and that the work done at Didlington was equal to any he had ever seen. Mr. Hubbard, in responding, was afraid Mr. Shaw had given him too much credit, but even the most difficult portions of the work,—and all must admit there were great difficulties to encounter,—were made comparatively easy by the details and drawings supplied to him by the architect.

Arlesey.—Portland Cement Works of considerable extent have recently been erected at Arlesey siding upon the Great Northern Railway by the Arlesey Lime and Portland Cement Company. We are informed that the position of the property, which has been developed for some years as a lime manufactory, is advantageous for the production of cement, owing to the proximity of grey chalk and gault clay to the railway. The present extension of the works has cost upwards of £20,000.

The Baths of Bath.—Encouraged by the success that has attended their efforts to improve the accommodation for invalids resorting to Bath for bathing purposes, the corporation of that city have determined to enter upon further improvements. With that view the City Architect, Mr. C. E. Davies, has recently paid a visit to some of the most esteemed European baths in order to observe the most recent improvements, so that they may be applied to the new and enlarged system of baths that the Corporation intend to erect. Quite a new spirit seems to have fallen on the Corporation, and now that the city is placed within a two and a-half hours' journey from London, with a bathing establishment rivalling any in Europe, together with the improvements recently effected in the town itself, we may hope to see Bath restored to a position equal to that she held at the end of the eighteenth century.—*Lancet.*

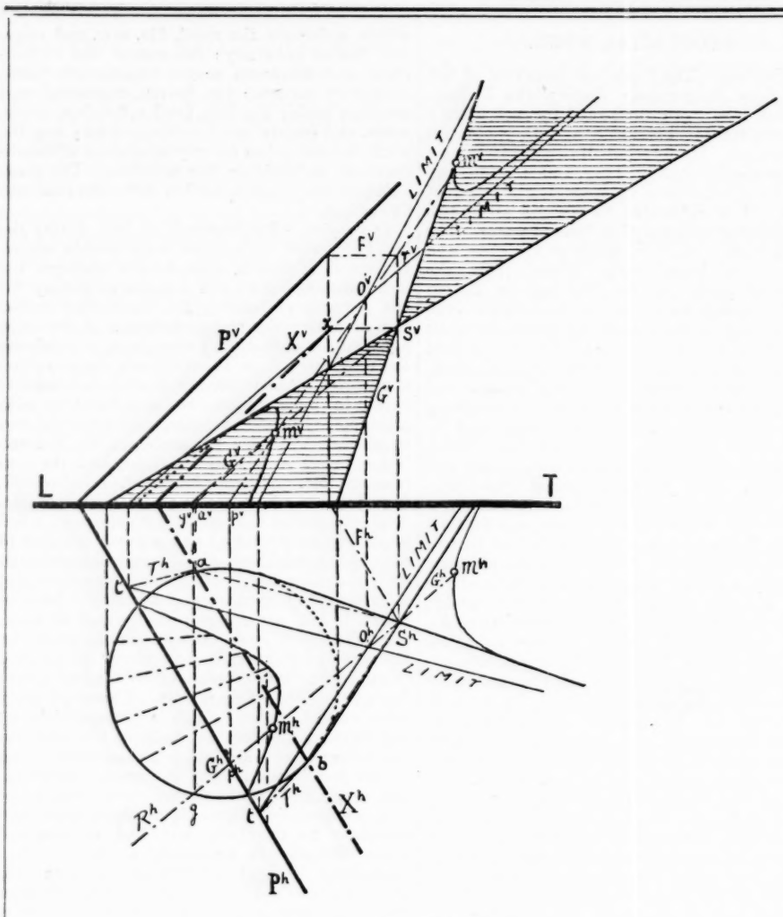


Fig. 120.

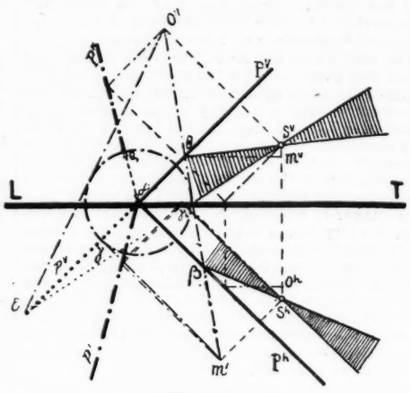


Fig. 121.

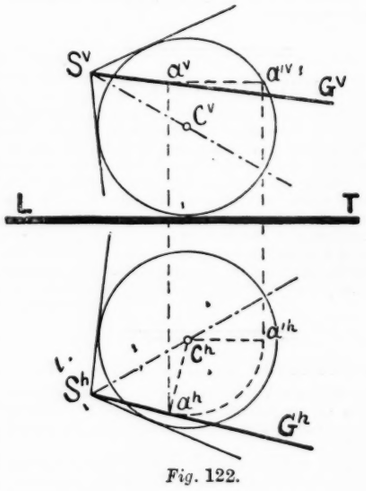


Fig. 122.

The Student's Column.

DESCRIPTIVE GEOMETRY.—PART II.

VII.

Important observation for drawing the curves of the sections.

IT can be proved by algebraical calculation that the projections of ellipses, hyperbolas, and parabolas are either straight lines, or again ellipses, hyperbolas, and parabolas. It can be proved also in the same way that in developing a cone, the sections become again elliptical curves, hyperbolas, and parabolas, according to what they were before developing.

Find direct the projections of the hyperbolical section of any cone by a plane P *not perpendicular to the elevation.*

We cut both the cone and the plane P by a series of vertical planes, such as the plane R passing through the apex S of the cone. These planes will cut the cone along the generators G; on the other hand, if, by the means of an horizontal line F of the plane P, we find r the point where the projecting line SS^h cuts the plane P, we shall have in r a point where all the intersections of the plane P will pass. We know their traces p, we can deduce their elevations p^v r^v, and at their respective intersections with the generators of the cone we get points m of the section required.

To find the limits we must remember that they are the intersections of the planes tangent to the cone along the generators parallel to the plane P. The horizontal line Sx through S allows us to draw the traces of a plane X which passes through the apex of the cone and is parallel to the plane P. Where the trace X^h meets the base of the cone we have the feet a and b of the generators that are parallel to the plane P. Through a and b we draw the traces T^h of the planes tangent to the cone, and the points t, where they meet the trace P^h, are points of the limits. The projections of the limits themselves will be parallel to the projections of the generators $a\,s$ and $b\,s$, for both the limits and these generators are intersections of parallel planes by a third plane (see fig. 120).

Draw a cone by the means of its apex S *and its circular base of radius* $a\ \rho$ *placed in a given plane* P.

We find the point m where a vertical line passing through S cuts the plane P. When we lay down the plane P on the plan, by turning it down round its trace P^h we find m^1 the position of m on the turned down plane as well as the circular base of the cone. From m^1 we draw the tangents $m^1\,\beta$ and $m^1\,\gamma$ to the base of the cone; they are the intersections of the plane P by vertical planes tangent to the cone and passing through S; in other words, they are the intersections of the plane P by the planes which give us the horizontal projections of the outside generators of the cone. When we move back the plane P to its original position $m^1\,\beta$ and $m^1\,\gamma$ become $S^h\,\beta$ and $S^h\,\gamma^h$. We make a similar operation with a point O of the plane P situated on a line passing through S and perpendicular to the elevation, and turning down the plane P round its vertical trace we get O^{11}; then draw the tangents $O^{11}\,\varepsilon$ and $O^{11}\,\theta$, and turning back the plane P to its original position get $S^v\,\theta$ and $S^v\,\varepsilon$ as outline of the cone on the elevation. (See fig. 121.)

Draw a right cone in any position.

Such a cone circumscribes spheres, and therefore we need only draw one of those spheres and the projections of the apex of the cone.

It is very easy to draw any generator G, for we know that any horizontal section of the sphere will touch some generator of the cone; therefore, if the projection G^h of the generator be given, and from c^h we take a perpendicular to G^h, the point a^h will be the plan of the point of contact of the generator G and the cone. By a horizontal rotation of the sphere we get a^{1h}, and find a^{1v}, and deduce therefrom both a^v and G^v, so that we have both projections of the generator G. (See fig. 122.)

Water Supply, Pontefract.—Mr. George Hodson, C.E., of Loughborough, has been retained by the Corporation of Pontefract to report upon their existing waterworks and propose a scheme for obtaining water from a new source.

CHURCH-BUILDING NEWS.

Marldon (*near Torquay*).—Funds are being raised for the restoration of the parish church of St. John the Baptist, Marldon, situated about five miles from Torquay, and two miles from Paignton. Marldon Church has not, during the last fifty years, until recently, undergone repairs of any magnitude, and it is stated that the necessity has now arisen of making a thorough restoration. To cover the cost of all that is proposed to be done, more than 1,500*l*. is required. The work in hand up to the present time has necessitated an expenditure of nearly 800*l*. The designs for the restoration have been prepared by Mr. R. Medley Fulford, of Exeter, and the contractor is Mr. P. Blowey, of Plymouth.

Pyworthy (*Devon*).—The parish church of Pyworthy, which has been under restoration for about ten months, is now approaching completion. During the progress of the work, several interesting discoveries have been made. First, a sedilia, on the south side of the chancel, with three seats. The cusped openings are carried on circular shafts, with moulded caps and bases. The whole is of a local stone much resembling the Hatherleigh, and is of Early English date. The mouldings of arches, &c., had been much hacked away, no doubt during the time when the church was last "improved," when the moulded string-course of Polyphant stone which ran all round the chancel was back, no doubt to give "a nice unbroken appearance" to the plastered walls. The stone string has now been replaced. The level of the seats was little above the floor level,—so seats of oak will be put in above the stone ones to raise the level. The sedilia has been well restored in Hatherleigh stone by Mr. Petherick, of that town. Near the south chancel, or priests', doorway, was discovered, in a mutilated state, a large example of a "low-side" or "lepers" window. The roofs are now complete, the tower repaired and repainted, with its interior opened up, and a new oak ceiling and floor added. New stonework has also been put to the windows where missing or decayed, and the old nave arcade and clearstory windows have been cleaned and repaired. Owing to want of

funds the screens, vestry, and organ-chamber have been deducted from the original tender for the work. The contractor is Mr. T. Blowey, of Plymouth, and the architect is Mr. R. Medley Fulford, of Exeter.

Bournemouth. — The Bennett Memorial Church, erected as a memorial of the late Rev. A. M. Bennett, has been opened for service. The church, which is dedicated to St. Stephen, has been designed by Mr. J. L. Pearson, R.A. The portion of the church now opened is groined with stone and has a lofty appearance. The nave is 24 ft. wide, 48 ft. high to the point of the groining, and about 90 ft. long. It is divided into six bays, that at the east end contracting towards the chancel. The lower part of the western bay of the nave is treated as a baptistery, and is vaulted at the level of 15 ft. above the floor, the vaulting being supported by four clustered columns, which form a narthex or Galilee, in the centre of which the font is placed. Over the narthex is a western gallery. The aisles of the nave are double, and are 22 ft. wide, divided by light clustered shafts. Over the arches of the nave arcade is a triforium which continues all round the church at this level. The clearstory consists of two-light windows, deeply recessed inside, under lofty pointed arches of nearly the same width as those of the arcade below. The transepts open out of the western bays of the chancel, and are prominent features, both internally and externally. In the southern one the organ-gallery will be placed on columns surrounded by an open parapet. The body of the walls is composed of brick, faced externally with Swanage stone, and internally with ashlar Bath stone. All the dressings are formed of the best Bath stone. The floor of the church is composed of wood and tiles, supplied by Messrs. Carter, of Poole. The tower and chancel remain to be erected. It is estimated that St. Stephen's will seat 800 adults. The gasfittings have been provided and put into working order by Mr. E. J. Thompson, of Bournemouth. The heating apparatus has been supplied by Messrs. W. L. Bacon & Co., of London. The altar fittings have been supplied, and the decoration of the chancel carried out by Mr. Heaton, of Charlotte-street, Fitzroy-square. The grounds surrounding the church have been laid out by Mr. J. S. Swaffield, of Bournemouth. The builders were Messrs. E. Abley & Co., of Salisbury, whose tender for the whole work, with additions and alterations, amounted to about 26,000*l.* Of that sum about 11,500*l.* has been expended on the present erection. The work has been carried out under the superintendence of Mr. W. Cowley, on behalf of the builders, and Mr. Athey was the clerk of the works.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

2,896. Weatherproof Paints, &c. O. Woolf.

The paint or varnish is made weather and water proof by the addition of an extremely hard silicious compound of lead or silver slag, containing about 25 per cent. silica and oxides of lead, iron, zinc, tin, and other metals.

2,959. Firegrate. H. Scott.

The grate is supported on a pivot and divided in the centre by a partition, one side being used for a coal and the other for a gas fire, either being brought to the front as required by revolving the grate.

4,249. Pug-Mill for Clay. J. H. Sharpe.

Two sets of beaters are made to rotate in opposite directions, or in the same direction at different speeds, one set of beaters moving with the shaft and the other with the outer casing to which they are attached.

4,226. Lavatories, &c. F. J. Candy.

The ventilating-shaft and waste-pipe are arranged near the corner of the room, and in front of it at a convenient height is a flap or basin hinged to a wall-plate fixed against a wall. The basin fits close against the vertical wall-plate when pushed up, and is turned into a horizontal position when required for use. Several shafts may be used side by side for basins, at heights suitable for various purposes. The corner of the room to which the appliance is fitted may have two doors, which, when open, form two sides of a closet, the walls forming the opposite sides. When out of use the hole will be hidden by one of the doors.

4,374. Metallic Roofing-Tiles. E. Edwards.

The tiles are cut or stamped from a sheet of metal which is afterwards bent into a peculiar form. A hollow channel is produced along each side, and the central part of the top edge is bent forward and the centre of the lower edge is bent backward, so that the tiles may be hooked together. Ears are left at the top corners to receive nails, by which the tiles are fixed, or small pieces may be left to be bent backwards, by which they are hung on the laths. The tiles are attached laterally by tongues and notches in the lower part of the channels, the tongue on one side is bent through a notch in the next.

4,405, Glazing. G. C. Warden and J. Ferguson.

The upper surface of the sash-bar is covered with soft metal, which serves as a cushion for the glass. The glass is secured in place by a strip of ductile metal fastened to the top of the central web by a light bar of iron, through which screws or rivets pass at intervals, or the soft metal may be riveted directly to the central web.

4,778, Lids for Moist-colour Pans. H. F. Brousson.

Glass, china, or other pans for moist colours are fitted with lids hinged thereto or sliding thereon, and fastened with a clasp.

4,856, Ornamenting Brick Blocks, &c. W. R. Cornell.

Bricks, blocks, or other surfaces are covered with a thin layer of cement or other analogous substance, and stones or glass or pieces of earthenware are, after cleaning if necessary, pressed into the cement to form the design required, and the bricks, &c., are then dried or baked.

4,252, Self-emptying Tipping Boxes. J. W. F. Bryan.

The end of the lever is cam-shaped, and bears against a fixed plate on the box. It is centred on the stud, set in a spring catch, which locks into a detent. When it is pulled by a rope half over, the catch is pressed outward, and the bottom of the box opens by its own weight, or that of its contents.

6,019, Wood Pavement. J. Kerr.

Wood blocks, previously subjected to the action of a pickle of creosote oil, are laid on a concrete bed, and the interstices are filled up with bitumen, with a top dressing of lime or cement grouting.

APPLICATIONS FOR LETTERS PATENT.

June 26.—7,770, R. Best, Central-light Gaseliers.—7,775, A. Roberts, Construction of Refuse Bins.—7,776, W. Wragg, Tool Handles and Method of Attaching same.—7,778, A. Grundy, Improved Lath for Venetian Blinds.—7,780, H. Campbell, Bench Vices.—7,795, T. and E. Durrans, Improvements in Nails.—7,806, J. Fliegal and E. Puttmann, Enamelled Sheet-iron Roofing.

June 27.—7,833, J. Osmond, Improvements in Letter Boxes for Doors.—7,834, J. Osmond, Door Fastening.

June 29.—7,849, J. Finnie, Appliances for Fixing Roof Gutters to Carrying Hooks.—7,861, T. Goosey, Combined Rule and Protractor.—7,863, F. Weber, Improvements in Drawing Boards.

June 30.—7,900, H. Cooper, Ventilating Houses and Public Buildings.—7,902, G. Wicks, Improvements in Door Furniture.—7,923, C. Broad and G. Harris, Inspection Gully Trap.—7,927, J. Midgley, Instantaneous Grip Vices.—7,928, J. Midgley, Parallel Vices.—7,942, W. Smith, Bonding Bricks and other Building Blocks.—7,966, W. White, Fire Grates and Stoves.

July 1.—7,983, W. Cook, Improved Bakers' Oven.—8,006, C. Biathwayt, Improved Latch.

July 2.—8,018, R. Hutchinson, Machine for Splitting Wood.—8,026, J. Coulter, Machinery for Dressing and Planing Stone, Marble, &c.—8,029, A. Hartshorn, Sanitary Closet Pans, &c.—8,044, E. Stewart and others, Improved Means for affording Ingress to and Egress from Rooms or Buildings.—8,047, R. McConnel, Devices for securing together Joists and carrying Girders.—8,059, J. Hamblet, Manufacture of Roofing Tiles, Drain, and Sanitary Pipes.

PROVISIONAL SPECIFICATIONS ACCEPTED.

4,613, R. Weir, Stoves or Furnaces for Heating Buildings, &c.—6,439, J. Ellis, Construction of Metal Rib for Bridge Floorings, for Columns and other constructive purposes.—6,686, G. Smart, Tool Stock or Brace.—6,842, C. Grimmett and J. Cook, Window-fasteners.—7,208, A. Hogg, Adjusting and Attaching Door-knobs or Handles to Spindles.—7,348, W. Riches, Improvements in Hinges.—7,362, W. Parnall, Improvements in Shop Counters.—5,137, R. Roberts, Window-fasteners for large Windows.—6,112, H. Chancellor, Self-acting Window-holder.—7,125, R. Nisbet, Improvements in Cooking-ranges.—7,191, J. A. & A. A. Clarke, Box Flues and False Backs for Fire-grates.—7,330, R. Hunter & J. Turnbull, Improvements in Kitchen-ranges.—7,546, W. Griffiths and A. Gibbs, Chimney Cowls and Ventilators and Appliances for abating Nuisances arising from Smoke and foul Air.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

11,817, E. Lines, Bolt-fastening for Doors, Windows, &c.—12,420, J. Westerman, Improvements in Bridges.—12,486, T. Freeman, jun., and C. Eardley, Machinery and Method of Manufacturing Hollow Bricks and other Hollow Clay or Plastic Building Materials.—12,607, W. Wise, Ventilating Apparatus.—2,626, J. Stevens and C. Major, Spring Hinges for Doors.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

JUNE 23.

By FAREBROTHER, ELLIS, CLARK, & Co.

Biggleswade, near—Part of the Henlow Grange Estate, comprising houses, numerous cottages, and 124a. 2r. 39p. in 20 lots £9,215

JUNE 27.

By G. B. SMALLPIECE.

Tilford, Surrey—Squire's Hill Farm, 24a. 1r. 19p. copyhold 1,200
An enclosure of heath land, 32a 1r. 33p. copyhold 750
A plot of land, 1a. 1r. 26p., copyhold 60
Chiddingfold—Freehold cottage and garden 270

JUNE 29.

By T. WOODS.

Hounslow Heath—Beavor's Farm, 46 acres, freehold 4,000

FRANKLYN & SON.

Essex, Bursted Green—Two freehold plots of land, 6a. 1r. 10p. 52
Stebbing Green—An enclosure of land, 3a. 2r. 31p. freehold 26
Enclosures of land, 14a. 3r. 16p. 105

By FRYER & SON.

Islington—14, St. George's-terrace, 24 years, ground-rent 6*l.* 360
101, Shaftesbury-street, 16 years, ground-rent 3*l.* 175
125, De Beauvoir-road, 36 years, ground-rent 5*l.* 380
4, Copenhagen-street, 7½ years, ground-rent 7*l.*.... 90
Stockwell—46, Lingham-street, 15 years, ground-rent 5*l.* 5s. 90

By BRADSHAW BROWN.

Millwall—74 and 76, West Ferry-road, 39 years, ground-rent 5*l.* 525
82 and 84, West Ferry-road, 33 years, ground-rent 5*l.* 425
Cubitt Town, Galbraith-road—A plot of freehold land 355
Poplar—37, Stainsby-road, 32 years, ground-rent 4*l.* 10s. 330

JUNE 30.

By GEORGE HEAD & Co.

Regent's Park—1, Sussex-place, 36 years, ground-rent 70*l.* 2,900

By MULLETT, BOOKER, & Co.

Addlestone—The freehold residence, "Ashleigh"... 700

By BROAD, PRITCHARD, & WILTSHIER.

Sloane-square—The lease of No. 80, term 9 years ... 300

By Messrs. FOSTER.

Lambeth—Ground-rents of 15*l.* a year, reversion in 24 years 1,200
Ground-rents of 10*l.* a year, reversion in 24 years 700

By DEBENHAM, TEWSON, & Co.

Brixton-hill—Builder's premises, freehold 600
1 and 2, Chatham Houses, freehold..... 975

JULY 1.

By WALKER & RUNTZ.

Tower Hill—1, 2, and 3, Sharpe's-buildings, freehold 1,040
Chelsea—An improved ground-rent of 16*l.*, term 22 years..... 135
Fulham—Ground-rent of 10*l.*, term 20 years 110
Chelsea—An improved ground-rent of 41*l.* 17s. 9d., term 23 years..... 415
An improved ground-rent of 7*l.*, term 54 years ... 95
An improved ground-rent of 4*l.* 10s. 6d., term 23 years..... 45
Brondesbury—19, 21, and 23, Netherwood-road, 83 years, ground-rent 25*l.* 4s..... 750
Hoxton—51, Bridport-place, 2 years, ground-rent 5*l.* 20
Pimlico—44, Commercial-road, 30 years, ground-rent 7*l.*..... 275
Chelsea—130, King's-road, the lease of, term 23 years..... 280
The lease of 1, Smith-street, term 10 years 200
Walham Green—21 and 23, Vauston-place, freehold 730
Fulham—102, 104, 110, 112, and 114, Estcourt-road, 60 years, ground-rent 8*l.* 15s. 690
Penge—4, 5, and 6, Lime Tree-avenue, 76 years, ground-rent 9*l.* 245
Pentonville—Ground-rent of 4*l.*, reversion in 25 years..... 162

By WEATHERALL & GREEN.

Stratford, High-street—Frehold wharf and premises 5,300
The freehold wharf and warehouse adjoining 1,100
Ground-rent of 15*l.* a year, reversion in 20 years... 900
Ground-rent of 35*l.* a year, reversion in 49 years... 1,010
Brixton—23 and 24, Kemerton-road, 88 years, ground-rent 10*l.*..... 515

By DRIVER & PERFECT.

Seven Sisters-road—6, 7, and 8, Stroma-terrace, 92 years, ground-rent 27*l.* 950

MEAKIN, MAY, & MAY.

Sydenham—19 and 20, Kent-terrace, 18 years, ground-rent 18*l.* 645

By ROGERS, CHAPMAN, & THOMAS.

Belgrave-square—6, Halkin-place, 84 years, ground-rent 10*l.* 550
Eccleston-square—43, Cambridge-street, 75 years, ground-rent 7*l.* 525

By F. JOLLY & Co.

St. Luke's—44, President-street East, freehold..... 750
City-road—10, Macclesfield-street, freehold..... 420
Holloway—168, Hornsey-road, 57 years, ground-rent 8*l.* 8s. 465
Newington Butts—49 to 63 odd, Edward-street, 58 years, ground-rent 22*l.* 3,375
Bethnal Green—22 and 24, Patriot-square, freehold 910
122, Cambridge-road, freehold 650

JULY 2.

WALTON & LEE.

Coldstream, Northumberland—"The Etal" Manor Estate, of 3,437a. 3r. 38p. 70,000

ARBER, RUTTER, & WAGHORNE.

Strand—No. 142, Freehold business premises..... 11,100

By BEAN, BURNETT, & ELDRIDGE.

City—87, Lower Thames-street, freehold 3,360
Sevenoaks, St. John's-road—"The Forest," and a plot of land..... 1,250
Crouch End—9 and 11, Lynton-road, 80 years, ground-rent 12*l.* 12s. 435

By GLASIER & SONS.

Holloway, Queensland-road—Ground-rents, 53*l.*, reversion in 48 years 1,090
Ground-rents, 12*l.*, reversion in 55 years 265
Highgate, Archway-road—Ground-rents, 12*l.*, reversion in 89 years 290

By T. B. WESTACOTT.
King's-cross—214 to 228 even, York-road, 65 years, ground-rent 92*l.* 8s. £2,205
By NORTON, TRIST, WATNEY, & Co.
Warlingham, near.—A plot of freehold land, 2a. 1r. 4p. 190
By MARSH, MILNER, & LANGTON.
Shepherd's Bush—160 to 166 even, Starch Green-road, freehold 3,710
Two policies for 500*l.* each, life aged 67 years 311
JULY 3.
JONES, LANG, & Co.
Peckham—35, Moncrieff-road, 75 years, ground-rent 4*l.* 10s. 280
48, 49, and 50, Moncrieff-road, 76 years, ground-rent 15*l.* 705
Pimlico—Stabling in Dorset Mews, 58 years, ground-rent 1*l.* 290
By T. D. WHITEHEAD.
Commercial-road, E.—Ground-rent of 64*l.* 5s., term 25 years 665
Brixton—4½, Barrington-road, 37 years, ground-rent 7*l.* 615
HUMBERT, SON, & FLINT.
Southend-on-Sea—A plot of freehold land, 1¼ acre 1,010

Miscellanea.

Tramways, Barrow-in-Furness.—The first section of the Barrow-in-Furness Tramways was officially inspected by Major-General Hutchinson, R.E., of the Board of Trade, on the 3rd inst. The line, which has been well laid on the Abbey-road, not far from Furness Abbey, and passes along Abbey-road, Duke-street, Strand, Salthouse, and Roose roads, and terminates at Roose, the total length being about four miles. The wide streets and roads of Barrow render the town particularly well adapted for tramways. The greater length of street through which the tramway is laid is 80 ft. in width, a portion of the same, about half a-mile in length, having just been completed by the Corporation. The tramway consists of a single line, with passing-places 3 chains in length at about every quarter of a-mile. The gauge is 4 ft. The rails are Gowan's, manufactured by the Barrow Steel Company, weighing 84 lb. to the yard, and the paving is laid with Welsh setts except on one or two steep gradients. The general construction of the line has been carried out by the Barrow Tramways Company in accordance with the specification prepared for the Barrow Corporation by Mr. Fox, C.E., the Borough Engineer, which determines the gauge, the rails to be used, the quality and method of paving, and general mode of construction. Mr. Vawser, C.E., of Manchester, has acted as engineer of the lines for the company, and Mr. Pritchard, C.E., of Birmingham, of the rolling stock and depôts. Mr. Fell, of Leamington, was the contractor. Steam is to be the motive power, the engines being manufactured by Messrs. Kitson, of Leeds.

New Baptist Chapel at St. Alban's.—A new chapel, belonging to the Baptist denomination, was opened in this city on Tuesday last. It is of red brick with stone dressings, and is carried out in the Early French Gothic style. The chapel, including the apse and baptistery building, is 94 ft. long by 37 ft. wide and 42 ft. high internally. There is an obvious departure from the ordinary arrangements of Dissenting places of worship in the wide centre aisle, with the pulpit and reading desk at the sides, instead of in the middle, and the raised apse with choir seats round it and the organ at the side. Another new feature is the open marble baptistery, with a handsome alabaster rail at the back of the apse in a separate octagonal building raised again from the apse floor. Below the chapel is a large and lofty schoolroom, and attached to it and to a chapel-keeper's house adjoining are fifteen class-rooms, all completely fitted and furnished for their various purposes. The marble baptistery and the marble in dados, columns, and friezes, were supplied by Mr. James Houghton; the mosaic floors of the apse and baptistery by the Campbell Tile Company; a stained-glass memorial window by Messrs. A. L. Moore & Co.; and the organ by Messrs. Bevington. The chapel has sittings for 630 persons, and is surmounted by a flèche, 80 ft. high. The whole has been carried out by Mr. T. Turner, of Watford, under the superintendence of Messrs. Glover & Salter, architects, at a cost of about 7,000*l.*

Sheffield.—In the parish church of Sheffield has just been placed another stained-glass window from the studio of Mr. W. F. Dixon, London. The window was erected by subscription to the memory of Mr. Arthur Thomas, and illustrates the parable of the Talents and other kindred subjects.

The Niagara Falls Park.—The Legislature of New York State did a good public act when it authorised the formation of a park at Niagara Falls, by which all the grounds and waters necessary for the preservation and public access to those great wonders of nature are secured to the people in perpetuity. The sum of one million and a half dollars has been appropriated by the State to secure the purchase of private property. Lands equal to a little more than 100 acres have already been bought. The grounds and buildings on both sides west and south of the hydraulic canal have also been taken by the Park Commissioners. The lines extend to the main channel of the river and middle of Horseshoe Falls, being the boundary line between Canada and the United States, and the purchase takes in Goat Island and all the little islets, with their various mills, streets, and passage ways. By the terms of the Act the whole tract is to be restored as far as possible to its original state of nature, and when this is accomplished, the trees grown, and all the improvements perfected, the attractions of Niagara will be increased a thousandfold. It will probably be news to a good many people in this country to learn that the original inception of this admirable project is due to to Lord Dufferin when he was Governor-General of Canada in 1878. His plan was that the Canadians on their side, and the Americans on theirs, should undertake to beautify and preserve the approaches to the Falls. His proposal was most cordially appreciated by the Governor of New York, Lucius Robinson, and the grand project is now in process of being realised. But it has involved much hard work on the part of private individuals to overcome the hostile influences that were arrayed against the work, especially from the owners of property.—*Iron.*

Cost of Government Buildings at Washington.—The cost of the principal public buildings in Washington is officially stated as follows:—The United States Capitol nearly 3,200,000*l.*; State, War, and Navy departments, 1,525,785*l.*; Treasury, 1,431,694*l.*; Patent Office (Interior Department), 649,155*l.*; the Post-office Department building, 430,200*l.*; Insane Asylum, 302,622*l.*; Washington National Monument, 220,000*l.*; Deaf and Dumb Institute, 150,200*l.*; the Executive Mansion, 147,116*l.*; the Botanical Gardens, 144,562*l.*; Smithsonian Institute, 98,530*l.*; United States Marine Barracks, 67,927*l.*; building used by the Bureau of Engraving and Printing of the Treasury Department, 73,386*l.*; Agricultural Department, 100,365*l.*; Government Printing Office, 59,200*l.*; National Museum, 50,000*l.*; United States Naval Observatory, 51,053*l.*; Arsenal, 54,065*l.*; Court-house, 55,030*l.*; Naval Hospital, 23,207*l.*; Department of Justice, 39,556*l.*; Army Medical Museum, 17,600*l.*; Executive Stables, 5,700*l.* It is calculated that the new Museum building will cost 40,000*l.* The Pension Office, which is only about half finished, has already cost more than the original estimate. It will be completed in about four years' time. In addition to the above buildings the Government has upwards of fifty which are rented, amongst those being the Money-order Branch of the Post-office Department, and likewise the Pension Office used by the United States Geological Survey.

Association of Municipal Engineers and Surveyors.—With reference to our report of this meeting on p. 35 of our last, we are asked to mention that Mr. Midgley read a paper and exhibited models and drawings of his disinfecting drain-ventilator, which is now being tried in the City of London and elsewhere. This was not, as we understand, included amongst the "crude projects" of whose introduction to the meeting Mr. McKie complained. On the contrary, we are told that a vote of thanks was given to Mr. Midgley for bringing his invention before the meeting.

"Two Seaside Resorts."—We observe that the leading article in our number for June 27 has been reprinted almost *in extenso* in the *Bournemouth Observer* of July 1st. Next time the editor of that print pays us the compliment of reproducing our remarks, he will perhaps be good enough to acknowledge the source of the articles which he thinks proper to appropriate.

Gift of a Park to Govan.—On the 27th ult. the Earl of Rosebery handed over to the Provost of Govan a public park of forty acres, purchased and laid out by Mrs. Elder, widow of Mr. John Elder, founder of the Clyde firm of shipbuilders. The total cost has been 50,000*l.*

Henry's Mote, Pembrokeshire.—The Bishop of St. David's opened Henry's Mote Church, after a very complete restoration, on Friday, the 3rd inst., the work including reseating so as to accommodate sixty additional persons. A north porch and south vestry have been added, the chancel rebuilt, and new roofs covered with Whitland Abbey slates have been placed on the nave, south transept, and chancel,—the latter being wagon-boarded and the former open to the ridge and plastered between the rafters, having arched principals. New bell gablet, north doorway, and windows throughout, in Doulting stone,—the latter filled with cathedral rolled glazing in patterns, supplied by Mr. Ben Gay, of Bristol,—have been provided. The stalls and seats are of varnished pitch pine on raised wooden platforms. The wrought-iron altar standards and door fittings were supplied by Mr. Brawn, of Birmingham; and the hot-air apparatus by Mr. Porritt, of Bolton. The old Norman font and credence table have been cleaned and refixed. The stone carving has been done by Mr. Herridge, of Cardiff; and the floors tiled by Webb's Worcester Tileries Company,—those in the chancel and sacrarium being highly glazed. The architect employed was Mr. E. H. Lingen Barker; and the builder Mr. John Lewis, of Musland, Pembrokeshire.

The Birkbeck Building Society.—The thirty-fourth annual meeting of the Birkbeck Building Society was held on the 2nd inst., in the theatre, 29 and 30, Southampton-buildings, Chancery-lane. The report, adopted unanimously by the meeting, shows that the Society's operations are of considerable magnitude. It states that the receipts during the year ending 31st of March last amounted to 7,261,244*l.*,—an increase of nearly half a million over last year,—making a total from the commencement of the Society of 84,640,676*l.* The deposits from members and others were 6,201,551; and the payments on shares were 212,910*l.* The gross profits on the year were 136,067*l.*, of which 122,148*l.* have been appropriated to the payment of interest to shareholders and depositors, and defraying expenses of management, leaving a net profit of 14,919*l.*, making, it is stated, with the balance brought from last year, a sum of 178,098*l.* in excess of liabilities. The balance-sheet shows a sum of 2,967,552*l.* of surplus funds, which are temporarily invested in Consols and other securities.

Harrow School Memorials.—A series of mural tablets has been erected in Harrow School Chapel to the memories of famous Harrovians, most of whom have died in the service of their country. Last week, on the eve of the "Speech Day," tablets were erected to General Earle, C.B., C.S.I., Colonel Burnaby, Major Boyd, Captain Edward Leveson Jervis, Lieutenant Richardson, &c. They are placed on the south side of the chapel, and are wrought in alabaster, with bands of very elaborate marble mosaic, and coloured marble inscription slabs with gilt letters, and are the work of Mr. Henry Terry, of the Lambeth-road.

The Statue of the late Lord Frederick Cavendish at Barrow-in-Furness was unveiled last week by Earl Spencer. We gave a view of the work (of which Mr. A. Bruce Joy is the sculptor) in the *Builder* for October 4, 1884.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	6 10 0	7 10 0
Teak, E.I. ....load	12 10 0	15 10 0
Sequoia, U.S. ....ft. cube	0 2 6	0 2 9
Ash, Canada ....load	3 0 0	5 0 0
Birch ,, ...	3 0 0	4 10 0
Elm ,, ...	3 10 0	5 0 0
Fir, Dantsic, &c.	1 10 0	4 10 0
Oak ,, ...	3 0 0	5 0 0
Canada	6 0 0	7 0 0
Pine ,, red	3 0 0	4 0 0
,, yellow	3 15 0	5 5 0
Lath, Dantsic ....fathom	5 0 0	6 0 0
St. Petersburg	5 0 0	7 0 0
Wainscot, Riga....log	3 0 0	4 10 0
Deals, Finland, 2nd and 1st...std. 100	8 0 0	9 0 0
,, 4th and 3rd	6 10 0	7 10 0
Riga	7 0 0	8 10 0
St. Petersburg, 1st yel.	10 0 0	17 0 0
,, 2nd ,, ...	8 0 0	9 15 0
,, white	7 0 0	11 0 0
Swedish....	7 0 0	17 0 0
White Sea	8 10 0	19 0 0
Canada, Pine 1st	18 0 0	32 10 0
,, 2nd	12 0 0	18 10 0
,, 3rd, &c.	7 0 0	10 10 0
,, Spruce 1st	9 0 0	12 0 0
,, 3rd and 2nd	6 10 0	8 0 0
New Brunswick, &c....	5 0 0	7 10 0
Battens, all kinds	4 0 0	13 0 0
Flooring Boards, sq. 1 in.—Prepared, first	0 9 0	0 13 0
Second	0 7 6	0 8 6
Other qualities	0 5 0	0 7 0

TIMBER (*continued*).	£.	s.	d.	£.	s.	d.
Cedar, Cuba.....foot	0	0	3½	0	0	4
Honduras, &c.	0	0	3	0	0	4
Australian	0	0	3	0	0	3½
Mahogany, Cuba	0	0	5	0	0	7
St. Domingo cargo av.	0	0	5½	0	0	6½
Mexican ,, ...	0	0	4	0	0	5
Tobasco ,, ...	0	0	4½	0	0	6½
Honduras ,, ...	0	0	4½	0	0	6¼
Rose, Rio .....ton	7	0	0	17	0	0
Bahia.....	7	0	0	16	0	0
Satin, St. Domingo ..... ft.	0	0	8	0	1	0
Porto Rico	0	0	8	0	1	3
Walnut, Italian	0	0	4	0	0	5
METALS.						
COPPER—						
British, cke. and ingt. .....ton	47	10	0	48	10	0
Best selected	48	10	0	49	0	0
Sheets, strong.....	55	10	0	56	0	0
,, India	52	10	0	53	0	0
Australian, fine cash.....	54	19	0	56	0	0
Chili, bars ,, ...	44	2	6	44	10	0
IRON—Pig in Scotland .....ton	2	0	9	0	0	0
Bar, Welsh, in London.....	5	0	0	5	7	6
,, ,, in Wales	4	12	6	4	17	6
,, Staffordshire, London	6	0	0	7	0	0
Sheets, single, in London.....	7	10	0	9	0	0
Hoops ,, ...	7	0	0	8	0	0
Nail-rods ,, ...	6	0	0	7	0	0
YELLOW METAL.....lb.	0	0	4⅝	0	0	4⅞
LEAD—Pig, Spanish	0	0	0	0	0	0
English, com. brands	12	10	0	0	0	0

METALS (*continued*).	£.	s.	d.	£.	s.	d.
SPELTER—						
Silesian, special .....ton	13	10	0	13	12	6
Ordinary brands	13	5	0	13	7	6
TIN—						
Straits	94	5	0	94	10	0
Australian	94	0	0	94	10	0
English ingots.....	93	0	0	94	0	0
TINPLATES—						
IC coke .....box	13	6	0	16	0	0
IX ditto	21	0	0	25	0	0
IC charcoal	17	0	0	20	0	0
IX ditto	26	0	0	27	0	0
OILS.						
Linseed.....	21	15	0	22	0	0
Cocoanut, Cochin .....ton	32	10	0	33	0	0
Ceylon	27	10	0	27	15	0
Copra.....	25	10	0	26	10	0
Palm, Lagos	30	0	0	0	0	0
Palm-nut Kernel	26	10	0	0	0	0
Rapeseed, English pale.....	26	0	0	0	0	0
,, brown	24	0	0	0	0	0
Cottonseed, refined	21	0	0	22	10	0
Tallow and Oleine	25	0	0	45	0	0
Lubricating, U.S.	7	0	0	10	0	0
,, Refined	8	0	0	15	0	0
TURPENTINE—						
American, in cks. .....cwt.	29	0	0	29	3	0
TAR—Stockholm .....brl.	22	0	0	22	6	0
Archangel.....	14	0	0	14	6	0

CONTRACTS.

Epitome of Advertisements in this Number.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Broken Guernsey Granite	West Ham Local Brd.	Lewis Angell.....	July 14th	xxvi.
Kerbing, Tar-Paving, &c., Works.....	Lewisham Brd. of Wks.	*Official*	do.	xxvi.
Painting, Colouring, &c.	War Department.....	do.	July 15th	i.
Aberdeen Pitching & Broken Guernsey Granite	Vestry, Mile End.....	J. M. Knight	do.	xxvi.
Erection of Station Buildings and Additions...	Midland Railway Co....	A. A. Langley	July 16th	ii.
Roads, Sewers, &c., Upper Norwood	Beulah Park Estate ...	W. N. Dunn	do.	xxvi.
Stone Kerb, and Repair of Roads	Mortlake Highway Brd.	J. Medworth.....	July 18th	xxvi.
Roadway and Pipe Sewer	Thos. Burberry	Jas. Gibson	do.	ii.
Sewage Works	Colne and Marsden L. B.	H. Bancroft	July 20th	xxvi.
New Cemetery Buildings, &c.	Chelmsford Local Brd.	C. Pertwee.....	do.	ii.
Alterations to Closets, &c., Repairs, and Making-up Roads	Wandsworth Bd. of Wks	*Official*	July 21st	ii.
Blue Guernsey Granite	Brentford Local Board	— Lacey.....	do.	xxvi.
Ironwork	Hackney Board of Wks	J. Lovegrove.....	July 22nd	ii.
Widening, &c., of Bridge.....	Greenwich Bd. of Wks.	*Official*	do.	ii.
New Sewerage Works, &c.	Vestry of St. Marylbne	do.	July 23rd	ii.
Main Sewer, Engine-House, &c.	Barking Town Locl Brd	B. S. Brundell and C. I. Dawson	do.	ii.
Drainage, &c., and Laying-out of Cemetery...	Cheshunt Burial Board	*Official*	July 25th	ii.
Sewage Works Extension	Tottenham Local Board	— De Pape	July 27th	ii.
New Post-Office, Halifax	Com. of H.M. Works ...	*Official*	do.	ii.
Painting, &c., Works, Darenth, Kent.....	Met. Asylums Board ...	A. & C. Harston	do.	xxvi.
Sanitary Alterations, Improvements, &c.	Guardians, St. Matthew, Bethnal Green	do.	July 28th	ii.
Chimney Shaft, Sheds, &c., for connexion with a Refuse Destructor	Southampton Corporatn	W. B. G. Bennett.....	do.	xxvi.
Sewerage Works, Hawkhurst.....	Cranbrook U. R. S. A....	W. Noot	do.	xxvi.
Roads, Cambridge	Rock Freehold Land Soc	*Official*	July 29th	i.
Cricket Ground, Preston Park	Brighton Town Council	P. C. Lockwood.....	July 30th	xxvi.
New Botley Drainage	Oxford Local Board ...	W. H. White	August 1st	ii.

TENDERS.

For new Board school, Upper Kennington-lane, S.E., for the London School Board. Mr. T. J. Bailey, architect:—

Perry & Co.....	£16,234	0	0
W. & F. Croaker	16,169	0	0
W. Scrivener & Co.	16,160	0	0
Kirk & Randall	15,945	0	0
C. W. Reading	15,824	0	0
Turtle & Appleton	15,809	0	0
W. Shepherd	14,791	0	0
E. C. Howell & Son	15,767	0	0
B. C. Nightingale	15,569	0	0
Lathey Bros.	15,327	0	0
Grover & Son	15,262	0	0
H. Holloway.....	15,243	0	0
H. Hart.....	15,180	0	0
W. Johnson	15,100	0	0
Holloway Bros.	15,027	0	0
T. Boyce	14,837	0	0
C. Cox	14,770	0	0
J. Holloway.....	14,695	0	0
M. Gentry.....	14,654	0	0
C. Wall	14,629	0	0
W. Brass & Son	14,573	0	0
W. Downs.....	14,556	0	0
Atherton & Latta	14,546	0	0
Wall Bros.	14,458	0	0
J. Jerrard.....	14,439	0	0
W. Oldrey	14,317	0	0
Stimpson & Co.	14,178	0	0

For general repairs to the Royal Medical Benevolent College, Epsom. Mr. J. R. Harding, surveyor:—

Taylor.....	£390	0	0
Munday	330	0	0
Potter.....	325	0	0
Paine	285	0	0
Howell & White	285	0	0
Killick	270	0	0
S. Case & Son	269	2	6
Hughes	250	0	0
W. H. Batchelar.....	247	0	0
Chivinton	236	10	0

For the erection of new premises, 256, Edgware-road, corner of Chapel-street. Mr. N. S. Joseph, architect:—

M. Patrick	£4,874	0	0
Williams & Sons	4,717	0	0
F. Mark	4,700	0	0
Scrivener & Co.....	4,252	0	0

Accepted for external repairs and alterations to bar at Carlton Arms Tavern, Devonshire-street, Mile End. Mr. W. C. Livermore, architect and surveyor:—

England & Thompson	£385	0	0

Accepted for the erection of four houses with workshops in rear at William-street, Blackfriars. Mr. W. Hewson Lees, architect:—

J. B. Axford	£3,700	0	0

Accepted for the erection of two houses (exclusive of fittings) on North Cliff, Southwold, Suffolk. Mr. W. Hewson Lees, architect:—

Jas. Thompson	£1,350	0	0

Accepted for building a double cottage at the County Asylum, Thorpe, Norwich. Mr. T. H. B. Heslop, C.E., County Surveyor:—

E. Hawes, Norwich.....	£260	0	0

Accepted for painting the old Asylum and farm premises:—

Walter Bird, Norwich	£255	0	0

[No competition.]

Accepted for alteration to and building new workshops at No. 88, Westminster Bridge-road, for Mr. T. Dunkley. Mr. G. Treacher, architect, 23, Carter-lane, E.C.:—

J. Beale	£540	0	0

[No competition.]

For building a new toll-house at Yarmouth, Isle of Wight, for the Isle of Wight Highway Commissioners. Mr. J. E. Haynes, surveyor:—

Jenkins	£190	0	0
Barton.....	165	0	0
Denham (accepted).....	135	0	0

For the extension of main sewers at Criccieth. Mr. Thomas Roberts, Assoc. M. Inst. C.E., engineer:—

Jones, Criccieth	£442	18	0
Owen, Portmadoc	327	0	0
Thomas, Barmouth.....	292	5	0
Hughes, Portmadoc	282	0	0
Mathews, Criccieth.....	278	0	0
Davies, Portmadoc	270	0	0
W. Jones, Criccieth.....	257	12	0

[Engineer's estimate, 349*l.* 17s. 7d.]

For new waterworks, Sutton-in-Ashfield, Notts. Mr. George Hodson, C.E., Loughborough, and Mr. Herbert Walker, C.E., Nottingham, joint engineers:—

Macfarlane, Strang, & Co.....	£4,658	0	0
Cochrane & Co.....	3,876	10	6
Firmstone Bros.	3,612	12	4
James Okes & Co.....	3,594	0	0
Staveley Iron Company	3,504	8	7
Butterley Iron Company	3,440	0	0
Claycross Iron Company	3,432	8	4
Stanton Iron Company (accepted) ...	3,434	2	6

For pulling down and rebuilding the Rodney's Head public-house, Rodney-street, Pentonville, including barfittings, for Mr. J. Wild. Mr. J. Laws, architect, Fellows-road, South Hampstead. Quantities supplied:—

Marr.....	£2,646	0	0
Toms	2,587	0	0
Beal	2,550	0	0
Jackson & Todd	2,425	0	0
A. G. Allard (accepted).....	2,410	0	0

For the erection of the Church of St. Mary, Stamford Brook. Mr. Chas. J. Gladman, architect:—

T. Huzzey	£7,950	0	0
Humphreys	7,915	0	0
Stimpson & Co.....	6,360	0	0
Goddard & Son	5,986	0	0
Dove Bros.....	5,775	0	0
Dorey	5,560	0	0

For taking down and rebuilding warehouse on site of No. 163, Aldersgate-street, for Mr. Woolf Hyman. Mr. J. Douglass Mathews, architect. Quantities by Mr. John S. Quilter:—

Conder.....	£4,190	0	0
Mills.....	4,040	0	0
Dove Bros.....	3,963	0	0
Nightingale	3,833	0	0
Brass	3,693	0	0
Stimpson & Co.....	3,583	0	0
Grover & Son	3,576	0	0
Ashby & Horner	3,468	0	0
Kilby & Gayford	3,383	0	0

For rebuilding premises at No. 246, Upper-street, Islington, for Mr. H. B. Harding. Mr. E. Harrison, architect. Quantities by Mr. B. W. Swinstead:—

Dove Bros.....	£2,715	0	0
Dearing & Sons.....	2,580	0	0
Smith	2,469	0	0
Coombs	2,467	0	0
Stimpson & Co.....	2,390	0	0
Bayles	2,210	12	0
Ward & Lamble	2,137	0	0

For alterations to the premises known as Burlington Buildings, Heddon-street, Regent-street, W., in adapting same for residential chambers, for Mr. Edward Easton. Mr. D. Cubitt Nicholls, architect. Quantities by Mr. H. P. Foster:—

Titmas.....	£5,470	0	0
R. Hunt	5,369	0	0
Conder.....	5,246	0	0
Grover & Sons	5,187	0	0
Stimpson & Co.	4,765	0	0
Gentry.....	4,530	0	0

For erecting two warehouses on the site of No. 56, Wilson-street, and Nos. 2 and 3, Earl-street, Finsbury, for Mr. David de Pinna. Mr. John Groom, architect. Quantities by Mr. Mark W. King:—

J. T. Chappell	£4,077	0	0
Dove Bros.....	3,975	0	0
Holloway.....	3,842	0	0
Mortar.....	3,685	0	0
Stimpson & Co.....	3,660	0	0
Maddock	3,639	0	0
Greenwood	3,600	0	0
Sabey	3,495	0	0

For the erection of four houses in Turnham Green-terrace. Messrs. Wylson & Long, architects:—

W. Langridge & Son	£3,543	0	0
S. Hunt	3,175	0	0
H. Whitman	3,110	0	0
W. Collier	3,000	0	0
W. Blackburn	2,986	0	0
C. Rogers	2,855	0	0
S. Belham & Co.	2,643	0	0
J. Goodwin.....	1,988	0	0

Accepted for new house, Buckland, Surrey. Mr. W. G. Bartleet, architect, New Broad-street:—

H. Batchelar.....	£1,943	0	0

Accepted for lodge at Leigh, Surrey, for Mr. F. Charrington. Mr. F. C. Lees, architect, 44, Great Marlborough-street:—

H. Batchelar.....	£330	0	0

Accepted for Lich Gate, Leatherhead Church, Surrey:—

H. Batchelar.....	£135	0	0

For the completion of eight unfinished houses on east side of Gladys-road, Kilburn, for the executors of the late Mr. William Newton. Mr. Richard Hansom, architect:—

Richens & Mount.....	£2,875	0	0
S. Dainton	2,481	0	0
Oldrey	2,476	0	0
J. Gregory.....	1,836	0	0
C. Cheshir	1,596	0	0
J. Allen & Sons.....	1,569	0	0

[Architect's estimate, 1,570*l.*]

For the completion of five unfinished houses on the west side of Gladys-road, Kilburn, for Mr. Samuel Jones. Mr. Richard D. Hansom, architect:—

Richens & Mount.....	£1,720	0	0
S. Dainton	1,598	0	0
Oldrey	1,594	0	0
John Allen & Sons	1,550	0	0
Charles Cheshir.....	1,170	0	0
T. Byford (too late).....	1,350	0	0

[Architect's estimate, 1,150.]

For the erection of warehouses, &c., in Smithfield, for Mr. Isaac Beer. Mr. A. Cawston, architect. Quantities by Messrs. Sandall, Corderoy, & Selby:—

Adamson & Son.....	£6,480	0	0
Atherton & Latta.....	6,400	0	0
Higgs & Hill	6,363	0	0
E. Lawrence	6,253	0	0
J. & J. Greenwood	6,246	0	0
S. J. Scott (accepted)	6,183	0	0

Accepted for an additional warehouse to Messrs. W. J. Bush & Co.'s premises, Hackney. Mr. J. Hamilton, architect:—

S. J. Scott.....	£795	0	0

Accepted for the erection of business premises at Peckham. Quantities by Mr. Henry Lovegrove:—

S. J. Scott	£1,995	0	0

For the erection of six girls' houses and other works in connexion therewith at the Bethnal Green Schools at Leytonstone, for the Guardians of Bethnal Green. Messrs. A. & C. Harston, architects, 15, Leadenhall-street. Quantities supplied:—

Hudman & Worsley	£13,764	3	8
C. H. Stewart	13,180	6	0
England & Thompson	11,830	0	0
C. Proctor	11,800	0	0
J. Garrud	11,759	0	0
Ward & Lamble	11,656	0	0
W. Martin	11,638	0	0
Thomasson & Son	11,490	0	0
G. Dobson	11,420	0	0
J. Holland	11,371	0	0
Gregar	11,337	0	0
J. H. Johnson	11,180	0	0
Kirk Bros.	10,680	0	0
Jackson & Todd,* 192, Hackney-road	10,495	0	0

* Accepted.

For the erection of a shelter roof at the Eastern Ambulance Station, Brooksby's-walk, Homerton, for the Metropolitan Asylums Board. Messrs. A. & C. Harston, architects, 15, Leadenhall-street. Quantities supplied:—

Woodall, Marley, & Co.	£609	0	0
Dixsee, Bermondsey	575	0	0
Holmes & Co., Huddersfield	567	0	0
J. G. Josolyne,* 123, Borough	470	0	0

* Accepted.

For the construction of Priory-road culvert, for the Hornsey Local Board. Mr. T. de Courcy Meade, engineer and surveyor:—

Fields & Jones, New Cross	£3,715	0	0
Aspinall & Son, Hoxton	2,879	0	0
Nowell & Robson, Kensington	2,742	0	0
Mowlem & Co., Westminster	2,691	0	0
Pizzey, Hornsey	2,489	0	0
Walker, Upper Holloway	2,465	0	0
Killingback, Camden Town	2,400	0	0
Hale & Son, Paddington	2,394	0	0
Jackson & Son, Finsbury Park	2,365	0	0
Tongue, Plumstead	2,320	0	0
Williamson, Green-lanes	2,311	0	0
Nicholls, Wood Green	2,269	0	0
Adams, Moorgate-street	2,246	0	0
Cooke & Co., Battersea	2,105	0	0
Marshall, Brighton	2,029	0	0
Dunmore, Crouch End (accepted)	2,016	0	0
Wilkinson Bros., Finsbury Park	1,997	0	0

For the erection of boys' elementary schools at Paignton, Devon, for the School Board. Mr. W. G. Couldrey, architect, Paignton. Quantities by Mr. Charles Pinn, Exeter:—

Stephens & Bastow, Bristol	£3,750	0	0
W. Gibson, Exeter	3,560	0	0
A. Poole, Ilminster	3,440	0	0
Sanstom & Mumford, Torquay	3,037	0	0
H. Webber, Paignton	2,970	0	0
C. & R. E. Drew, Paignton	2,930	0	0
S. Webber, Paignton	2,900	0	0
W. J. Hatcher, Dawlish	2,860	0	0
N. Rundle,* Kingsbridge	2,614	0	0

* Accepted conditionally.

Accepted for sanitary work, including new bath-room and other alterations at No. 60, Lowndes-square, S.W., for Mr. Thomas Lloyd. Mr. Mark H. Judge, architect:—

Toten & Sons	£296	7	6

For additions and alterations at No. 12, Half Moon-street, Mayfair, W. for Mr. Reeves. Mr. D. Cubitt Nicholls, architect:—

Bulman & Dales	£618	0	0
G. H. & A. Bywaters	576	0	0
Wetherilt, Lee, & Martin	563	15	6

For painting and repairs to the Workhouse, Homerton, for the Guardians of the City of London Union:—

T. A. Woolnough	£2,220	0	0!
Duplock Bros.	1,475	0	0
W. Brass & Co.	1,350	0	0
J. Outhwaite & Son	1,350	0	0
A. Chard	1,326	0	0
Pack Bros.	1,300	0	0
W. Wythe	1,230	0	0
W. G. Lark & Son	1,174	0	0
J. & H. Cocks	1,100	0	0
C. F. Kearley	1,073	0	0
J. Camp	1,069	0	0
E. Proctor	1,030	0	0
Neave & Neave	959	0	0
F. & F. J. Wood	862	0	0
Dicksee & Dicksee	679	0	0
W. McCullock	672	0	0
J. Simpson & Son	593	0	0!

For alterations at Carr's Hotel, 265, Strand, for Mr. Charles Laver. Mr. Thomas Milbourn, architect and surveyor:—

	No. 1.	No. 2.
Prater	£875	£695 0 0
Salmon	788	620 0 0
Sanders & Sons	769	640 10 0
Patman & Fotheringham	738	543 0 0
Hunt*	697	543 0 0
Macey & Sons	685	587 0 0
Drew & Cadman	594	525 0 0

* Received too late.

For the erection of two terrace houses, being Nos. 5 and 6, Baring-terrace, St. Leonards, Exeter, and rebuilding front of No. 4 of same terrace. Mr. Charles Pinn, architect, Exeter. Quantities supplied:—

Phillips	£1,160	12	6
Scadding & Son	975	0	0
Stephens	941	0	0
Moass & Son	895	0	0
Gibson	870	0	0
Plimsoll	847	18	0
Steer Bros.	770	0	0
Holmes*	680	0	0

* Withdrawn.

SPECIAL NOTICE.—Lists of Tenders frequently reach us too late for insertion. They should be delivered at our Office, 46, Catherine-street, W.C., *not later than Four p.m.* on THURSDAYS.

TO CORRESPONDENTS.

G. S. (we should say that he could recover, but it is really a question of law).—C. W. (we have long ago been obliged to decline answering questions of that kind. See permanent notice to that effect below).—F. W. H.—W. M. C.

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

PUBLISHER'S NOTICES.

THE INDEX and TITLE-PAGE for Volume XLVIII. (January to June, 1885) are given, as a Supplement, with the present Number.

A COLOURED TITLE-PAGE may be had, gratis, on personal application at the Office.

CLOTH CASES for Binding the Numbers are now ready, price 2s. 6d. each; also

READING-CASES (Cloth), with Strings, to hold a Month's Numbers, price 2s. each; also

THE FORTY-EIGHTH VOLUME of "The Builder" (bound), price Twelve Shillings and Sixpence, will be ready shortly.

SUBSCRIBERS' VOLUMES, on being sent to the Office, will be bound at a cost of 3s. 6d. each.

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE, AND GENERAL ADVERTISEMENTS,

Six lines (about fifty words) or under ..... 4s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

Terms for Series of Trade Advertisements, also for Special Advertisements on front page, Competitions, Contracts, Sales by Auction, &c. may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about THIRTY words) or under ..... 2s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Money Order, payable at the Post-office, Covent-garden, W.C. to

DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

SPECIAL.—ALTERATIONS in STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same, must reach the Office before TEN o'clock on WEDNESDAY mornings.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office*, 46, Catherine-street, Covent-garden, W.C. *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum PREPAID. To all parts of Europe and America, 26s. per annum. To India, China, Ceylon, &c. 30s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street, W.C.

Best Bath Stone.
WESTWOOD GROUND,
Box Ground, Combe Down,
Corsham Down,
And Farleigh Down.
RANDELL, SAUNDERS, & CO., Limited,
Corsham, Wilts. [ADVT.

Bath Stone.
ALL DESCRIPTIONS OF BEST QUALITY.
PICTOR & SONS,
BOX, WILTS. [ADVT.

Doulting Freestone and Ham Hill Stone of best quality, in blocks, or prepared ready for fixing. An inspection of the Doulting Quarries is respectfully solicited; and Architects and others are CAUTIONED against inferior stone. Prices, delivered to any part of the United Kingdom, given on application to CHARLES TRASK & SONS, Norton-sub-Hamdon, Ilminster, Somerset.—Agent, Mr. E. WILLIAMS, No. 16, Craven-street, Strand, W.C. [ADVT.

Doulting Free Stone
HAM HILL STONE,
BLUE LIAS LIME
(Ground or Lump),
For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.

Asphalte.
Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.
Office:
No. 90, Cannon-street, E.C. [ADVT.

EVERY DESCRIPTION OF SEASONED WOODS AND VENEERS IN EXTENSIVE QUANTITIES.
B. J. HUDSON & SONS,
Whitfield-street, W.
Store-street, W.C., and
Great Peter-street, S.W., London.
Telephone No. 3,654, and Private Wire connecting Business Premises.

MICHELMORE & REAP,
Manufacturers of
CHARLES COLLINGE'S PATENT.
COLLINGE'S PATENT HINGES,
LEVER, SCREW, & BARREL BOLTS,
Self-Acting "FALL DOWN" GATE STOPS,
and IMPROVED GATE FITTINGS of every Description.
36A, BOROUGH ROAD,
LONDON, S.E.
DISCOUNT TO BUILDERS.

BRABY'S PATENT GLAZING.
GLASS SET FREE,
ALLOWING EXPANSION AND CONTRACTION, AND PRECLUDING BREAKAGE.
ABSOLUTELY WATERTIGHT. PAINTING AND PUTTY SUPERSEDED.
OVER ONE MILLION FEET FIXED.
DRAWINGS AND PRICES ON APPLICATION.
- MODELS AND SECTIONS ON VIEW. -
LONDON: 356 to 362, EUSTON ROAD.
LIVERPOOL: 6 and 8, HATTON GARDEN.
GLASGOW: 335, ARGYLE STREET.